QRPp

NorCal QRP Club EST 1993

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From the Editor

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We start year number 4 of the NorCal QRP club with this issue. Time really goes faster as you get older. My father used to tell me that, and I really didn't understand it at the time, but now I do. Those of you over 40 will know what I am talking about, those of you under 40 will in a few years. The reason that I bring it up is that you don't want to put off the things that you have been wanting to do but just haven't found the time for. Take the time to enjoy life, it is the only one that you will have. Build those projects, go out in the field and operate, put that antenna system up, upgrade your license, enter a contest, go on that DX expedition, it doesn't matter what you do to enjoy QRP, just do it.

Jim Cates, WA6GER has asked me to thank all of you who called and wrote him concerning his picture on the cover of the December issue. Jim wants to say thankyou and he is very appreciative of all the friends that he has in ham radio. I must tell you that Jim was very embarrassed when he saw the cover, he did not know that his picture was going to be on the cover. He also was pleased to hear from so many of his friends. I am really proud of the December issue, and especially pleased that I was able to honor such a good friend as Jim.

The December issue got caught in the Christmas mail, and there is nothing that we can do about that. It took over 30 days for some to get their copies of QRPp. We don't want to go to first class postage as that would really drive the cost up of putting out the journal. We just went to $10 last year and we want to hold the cost there as long as possible. Guys, please be patient, we put QRPp in the mail as soon as possible, and the rest is up to the post office. It is just not feasible to do first class mailing.

This issue is exciting in that there are several good construction articles. Derry Spittle, VE7QK has updated the Epiphyte, and now it has the amplifier and the VFO built in. The next thing for the Epiphyte 2 is the digital display. It will be in the June issue.

Wayne Burdick, N6KR is back with another of his special designs. I asked Wayne to design the rig he calls the 49er at Dayton last year. He agreed but said that he did not have time to do the board layout. I agreed to do the board layout, and the result is the neat little rig that is featured in this issue. Be sure to build it and bring it along when you come to Dayton. Enter the building contest and you might become famous. (Or you might just win a 1 year's extension to your QRPp subscription.)

The other project in this issue that is the Regenerative Receiver that was designed by Paul Harden, NA5N. We had a ton of fun building these for a local building contest, and they really work well. I learned a lot by building mine. If you want to build both projects for the contest, be our guest!

You will have noticed by now that I have changed the format of QRPp. The printer has made suggestions, and I have listened. The reason for the double columns is to make it easier to read. When your eyes don't have to travel so far across the page, it is easier and faster to read. The new cover stock is also very attractive and adds to the appeal of the journal.

I would like to thank all of you for the help that you gave NorCal at Pacificon. I would especially like to thank our four presenters at the QRP Forum, Derry Spittle, VE7QK, John Liebenrood, K7RO, Wayne Burdick, N6KR, and Stan Goldstein, N6ULU.

Hope to see you all in Dayton in May.
72, Doug, KI6DS

2nd Annual
Great Dayton Building Contest
Sponsored by NorCal QRP Club

NorCal QRP Club is again sponsoring the Building Contest at this year's Dayton Hamvention. We started it last year with the Pixie 2, and it was a great success. The idea was that we would hand out a schematic at the Hospitality Suite sponsored by the ARCI at the Day's Inn Dayton South, and that the entrants would pick up the needed parts at the flea market on Friday and Saturday, with the contest to be held Saturday night.

It was a lot of fun, but their were some things that needed to be ironed out. One of the problems was that for many the trip to Dayton is a once in a lifetime experience, and they should spend that time meeting people and experiencing Dayton, not searching for parts and building. Hey, we can build and locate parts all year long, but we can't talk with our QRP friends at the Hospitality Suite except for the time we are at Dayton.

So, we decided that for this year's contest, we would announce the project in advance and let you bring the completed entry to Dayton for judging on Saturday night. We have even expanded to two projects this year. They are the 49er 40 Meter CW transceiver designed by Wayne Burdick, N6KR on page 27 or the Regenerative Receiver designed by Paul Harden, NA5N on page 12.

All you have to do is pick your project or build both of them, and bring them to Dayton for judging by K5FO, KI6DS, and WA6GER. The prize? Bragging rights for one year, and a 1 year extension to your subscription to QRPp. We will award 3 prizes for each project, and the only requirement is that the rig actually works. We will hook them up to a 9V battery so make sure that you have a 9V connector or adapter to fit your rig.

You may use any type of construction that you wish. Circuit boards are available for the 49er, and can be obtained from information in the article. But, if you wish to roll your own, by all means feel free to do so. Remember, judging is Saturday night at the Hospitality suite at the ARCI Dayton Headquarters, the Day's Inn, Dayton South.

A LOUD!! LM386 AUDIO AMP

by Bill Hickox, K5BDZ
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After buying a mini-sized Radio Shack FM tuner for $5.00 (nonworking but quickly fixed), I decided to build my own small stereo amp to liven up the test bench with some Good Time Radio. It took me only about two hours to build two of the above amps to drive some small speakers. This little LM386 amp drives cheap 8 ohm 4" speakers loudly enough to go into distortion with an ear splitting volume! It even drives the 8 ohm Realistic Minimus 7 speaker system so loudly it hurts your ears. Yes, it will even allow you to hear in a room full of loud talkers! It's been tested and works on speakers from 4 ohms to 32 ohms. When demonstrated to Fred "Bonacontenshun". W5QJM, he told me to show it to the Austin Group at the Summerfest Convention the next week, and write an article. So here it is.

Many of you will agree that far too many LM386 audio amps in manufacturer's kits don't produce appreciable speaker volume. This design proves that the '386 is getting too many bum raps. I won't bore you with theory. Just build it and try it.

The more I work with IC designs in practical application (vs. theoretical IC ideal performance) and interface with IC manufacturing design engineers, the more I realize that to an IC, "a simple direct external IC ground is not necessarily the best IC ground!" This statement could be the basis of a 2,500 page thesis, but I will let it stand as is.

The circuit in Figure 1 is simple, yet contains a few changes from the "usual" LM386 circuits normally found in current designs. This design is no big secret and is definitely not proprietary. But it really works for me, and I hope it will work as for you, too.

The amps were constructed on perfboard. *Experience: when building an LM386 amp, connect all grounds to the pin 4 IC ground. LM386 amps do not like return grounds that depend on metal enclosures or other meandering paths!* A single amp can be constructed as small as 1 1/2" x 1 1/2" but give yourself room and trim off the extra perfboard later. I power my amp with a 12VDC 800mA wall supply scrounged from my junkbox. No hum or other power supply problems. This little amp will perform with voltages varying from 6VDC to at least 15VDC. Maybe higher. Naturally, the higher the voltage, the greater the output (within reason). Caveat: Watch those capacitor voltages.

The circuit in Figure 2 can be added if you wish to reduce the high frequency response (anti-hiss) and use the amp with communications equipment. The values in Figure 2 allow a roll-off characteristic that starts about 1.5kHz and attenuates the high frequencies at a design rate of about 6dB per octave. Also, for low frequency attenuation you could add a capacitor from ground to the connection between R2 and C1 in Figure 1. Capacitor values can range from .047 uF for "rumble" suppression in stereo amps to .2 uF for low frequency suppression in communications audio.

By adding jumpers across J1 in Figure 1, you can add about 6 dB of gain (depending on the value of R4) to the audio circuit. Even more gain if you delete R4 and use only C3. I did not need this circuit with my FM tuner, but I do often use this added gain in simple receiver circuits. Remember, however, that weak audio output may mean a very weak signal at the input. If you jumper J1 terminals and still have weak output, you might need to include a small 2N3904 preamp circuit at the input.

The anti-hiss circuit in Figure 3 was found in a St. Louis QRP Society **The Peanut Whistle** reprint of *From the pages of Stan's Journal*. It includes an output circuit in which the series resistor and parallel capacitor act as a low pass filter that peaks

around 800 Hz., favoring CW, but still allows easy monitoring of SSB. This another "anti-hiss" design that can easily be incorporated in LM380 as well as LM386 amps. According to the article, the 3 dB points are approximately 200 Hz. and 3 kHz. Note capacitor values.

Finally, a bit of experience for trouble shooting audio "motor boating" at high audio levels in any audio amp. Lowering the value of the power supply isolating resistor (R3 in Figure 1 above) should solve the problem. In my original Backpacker II design, I used a 22 ohm resistor in the power lead for the LM380 audio IC. Some units exhibited motorboating at high audio levels and the problem was traced to a high current draw that produced an excessive voltage drop on audio peaks. Replacing the 22 ohm with a 10 ohm resistor did the trick and mods were incorporated in all subsequent kits.

I hope you have fun building your next LM386 amp. I would enjoy hearing of your success and welcome all improvements or suggestions. 72, Bill, K5BDZ

Parts List

R1 100K Pot (Volume Control)
C1 .33uF (.1 to .47uF OK)
R2 10K
C2 100uF/25V Elec.
R3 10 ohm
C3 10uF/25V Elec.
R4 1.5K (1K to 1.5K OK)
C4 .0047uF
R5 10 ohm
C5 .068uF (.047 to .1uF OK)
U1 LM386 Audio IC

All resistors are 1/4 watt. Electrolytics should be 25 volts or higher.

A Loud! LM 386 Audio Amp (make two for stereo)

By Bill Hickox, K5BDZ - *Tejas Kits*

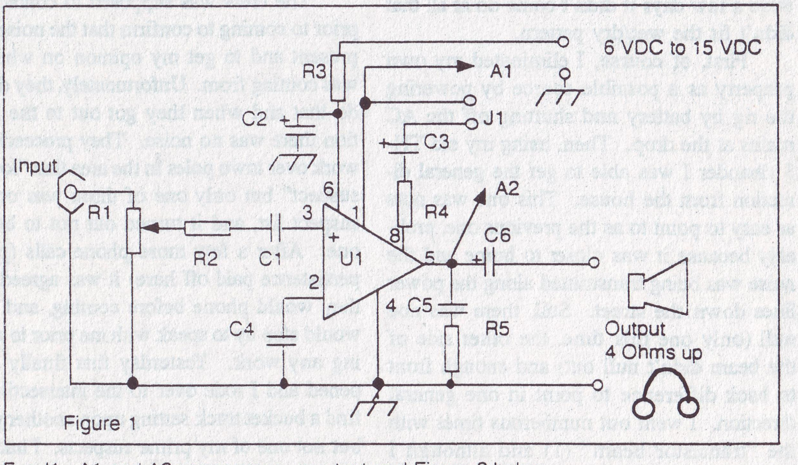

Figure 1

For J1, A1 and A2 connections. see text and Figure 2 below.

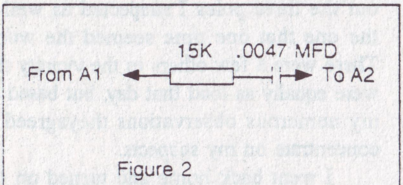

Figure 2

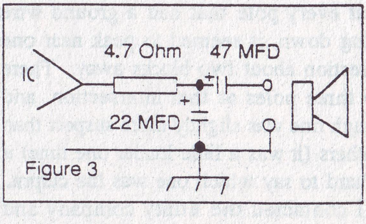

Figure 3

ANOTHER RFI CASE SOLVED (CHAPTER 2)!

by J.C. Smith, KC6EIJ
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I have written previously (June 1995 QRPp) about the RFI problem I located with the aid of a little battery powered "transistor radio" (AM broadcast band). Well, about six months after solving that one another one showed up. This one was even more puzzling, and even louder. We finally eliminated it yesterday, so here is the story.

The problem was on all the HF bands, all frequencies, the same frying sound as the previous case. There was no real pattern to it except that it always went away when it rained and remained off until things dried out thoroughly. Some times it was on 24 hours a day, other times it would tend toward the afternoon and evening, giving me a little relief from sometime early morning (1-3 AM) until about noon. Hot or cold weather didn't seem to matter, and there were a few days it didn't come on at all that didn't fit the wet/dry pattern.

First, of course, I eliminated my own property as a possible source by powering the rig by battery and shutting off the AC mains at the drop. Then, using my old TH-3 ribander I was able to get the general direction from the house. This one was nota as easy to point to as the previous one, probably because it was closer to home and the noise was being transmitted along the power lines down the street. Still, there was noe null (only one this time, the other side of the beam didn't null out) and enough front to back difference to point in one general direction. I went out numberous times with the "transistor beam" (1) and although I could pick up the noise all along the street, and at every pole that had a ground wire coming down, it seemed to peak near one intersection about two blocks away. There were three poles at that intersection, and although one was slightly more suspect than the others (it was a little louder one time) it was hard to say which one was the culprit.

I contacted the utility company and advised them I had another problem. Having been through this once before, I was able to bypass all the administrative front end and go right to the guy in charge of fixing it. If I had located the exact pole, I could have gotten quick service. However, since there were a number of suspects they wanted to get their "locater" out there to pin it down. That took a long time; in fact it never happened. In my service area at least, this guy has to be booked months in advance, and the two times he was supposed to come out here the noise was not present so I called and cancelled (this was much appreciated by the utility, and I think created some good will that helped get a repair crew out in spite of not knowing the exact location of the problem). Finally, they agreed to send out a crew to see what could be done without the specific pole being located.

The crew was supposed to contact me prior to coming to confirm that the noise was present and to get my opinion on where it was coming from. Unfortunately, they didn't do that and when they got out to the location there was no noise. They proceeded to work over towo poles in the area that "looked suspect" but only one of those was on my suspect list, and it turned out not to be the one. After a few more phone calls (polite persistence paid off here) it was agreed that they would phone before coming, and they would stop by to speak with me prior to starting any work. Yesterday that finally happened and I rode over to the intersection to find a bucket truck setting upon another pole, but not one of my prime suspects. I had my "transistor beam" (1) with me and I pointed out the three poles I suspected as well as the one that one time seemed the worst. There were a few others in the vicinity that were equally as loud that day, but based on my numerous observations theyagreed to concentrate on my suspects.

I went back home and turned on the rig to monitor the QRN. In a matter of an hour it stopped. Problem found. It was in

fact on my #1 suspect pole. One of the staples used to secure the bonding wire (the heavy, bare solid copper ground wire) to the post had been driven in too tight, and in time the wire broke under the staple crown. This created a spark gap. Apparently when the pole got wet it was sufficient to conduct the current around the break, but when things dried out the sparks would fly.

So, what did I learn this time? Again, the value of the little "transistor" radio as a noise locater, the value of polite persistence in dealing with the understaffed trouble-shooters of a public utility (you can thank the PUC of the Peoles Republic of Calfornia for that), and that it pays to be considerate of the utility companies time. If I hadn't called and cancelled my appointments, saving the "locater" a wasted trip, I might still be waiting for him to find the exact pole. Communicating directly with the crew doing the work also proved valuable. They probably would have found the problem their first trip if they had stopped to ask for my advice. I also learned the value of making numerous observations. It was only on one out of many trips to the noisy intersection that the bad pole was any louder than the others. Don't forget to also go check the suspect problem locations when the noise is NOT present on your rig. You want to be sure the noise is quiet there too. You can go out to almost any utility pole with a ground wire and find some noise any time, but it won't often be severe enough to cause QRN on your rig.

If you are having a noise problem, I wish you good luck in solving it. wehn you do (or if you already have some "solved cases" under your belt), why not write it up and share it so we all can learn from it? 72, JC Smith, KC6EIJ

1. "Transistor Beam": A typical battery powered AM broad cast receiver (transistor radio) has a wire wound ferrite core antenna. These little antennas are quite directional. The gain direction is usually off the front and back of the radio, with sharp nulls off the sides. The nulls usually prove more valuable than the peaks in this type of direction finding. Try it out on a known signal source like a distant broadcast station of known transmitter location.

SKELTON CONE ANTENNA

by Phil Polizzo, AC6LS
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Here is a fine wire antenna that is omni directional and covers 80-10 meters with an antenna tuner. You might even use it on 160 if you connect both ends of the feed line to the long wire input on your tuner.

I don't know what kind of performance it offers over other wire antennas, but I can tell you that it really does work! I have worked barefoot and QRP with this antenna with very good results. Recently I had a QSO with ZL2UW on 40 meters with my Sierra with 2 Watts. I have also worked some VK's and plenty of JA's, not to mention plenty of states. This works as a good antenna to put up at the QTH but you can make one for portable and FD use. It does take a little bit of space to set up.

Several fellow QRPers use the Skelton Cone as their main home antenna, including KI6PR, KK6IU and KI6DS. I got the information for the antenna from the following sources: *73*, (Aug. '69, pp. 133) and the *RSGB Handbook* (3rd Ed., pp. 387).

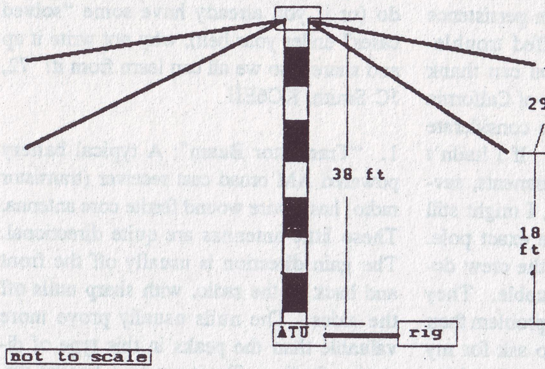
The antenna looks a lot like the G5RV in tandem on the same feedline with the legs spread apart. The feed point should be set around 38-48 feet high, with the legs (4, at 51 feet long each) sloping down at an angle so the ends are about 18 feet high.

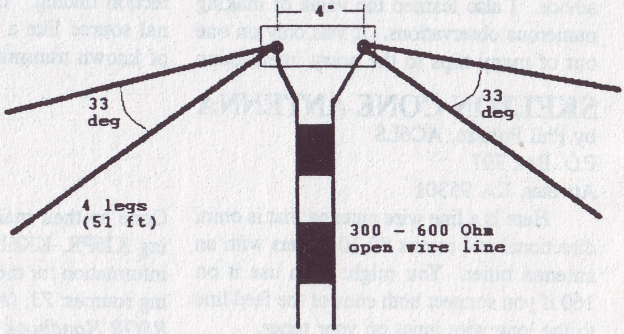
The legs should be spread about 33 degrees apart on opposing ends of the feed point, with the feedpoint set 4 inches apart. It should be noted that these measurements are not set in stone, as each installation will be different and is not a problem. Anything close to an "X" configuration when seen

from a bird's eye view seems to work.

Be sure to attach the feedline before you put the antenna up. Any twin lead that is 300-600 ohm will work. The 300 ohm twin lead I use (from Radio Shack) tunes a bit narrow compared to 450 ohm ladder line, but it works just fine. The feed line can be 48 or 78 feet, and if you need more, add in increments of 33 feet. NOTE: using coax with an in-line balun is NOT recommended.

I hope you try this out. It is a good antenna and is easy to build and put up. It has worked well for me and seems to work much better than a dipole. One of the reasons may be that there is little or no loss in the feedline (twinlead) as compared to a coax feedline. It is important to get as much signal into the atmosphere as possible when you are operating at QRP power levels. 72, Phil, AC6LS





ABOUT THE ST. LOUIS QRP SOCIETY

by Dave Gauding, NF0R
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The St. Louis QRP Society was organized in 1987 by local amateur radio operators interested in low power communications and homebrewing. Our members are residents of the Metropolitan St. Louis area and Metro East. Monthly meetings are dedicated to the enjoyment of amateur radio. The club does not have a charter or by-laws. business discussions are few and no minutes are taken. We do not elect officers in the traditional sense. Volunteers periodically step forward to moderate meetings, offer direction to the club or take responsibility for special projects. Our monthly newsletter keeps members up to date on club events, local amateur radio activities and happen-

ings within the QRP fraternity. The Peanut Whistle features original articles and commentary by members and contributing authors. We also reprint selected material from other sources on radios, accessories, antennas and construction. The club periodically assembles kits for sale to members only. Among our projects to date are a transmitter, receiver, three-band vfo, two keyers, three audio filters, spectral analyzer, the "St. Louis Tuner" and most recently an audio amplifier. We regularly present educational forums to help members become more familiar with the technical and historical aspects of radio as well as new directions being taken in our hobby. Proud owners routinely display the latest homebrew efforts at meetings as examples and encouragement for others. Novice builders may rely upon fellow members for assistance in completing projects and troubleshooting. The club maintains a modest inventory of donated components and hardware. Members may freely draw upon this reserve for homebrew projects in process. We operate an all homebrew Field Day and schedule portable outings in the spring and fall. The club calendar includes a homebrew competition, tailgate sale, key collector's night and a holiday dinner. We also maintain sub-groups for those specifically interested in the Heathkit HW-8, specialized antennas and coherent CW. Our members periodically staff information tables and present QRP seminars at local hamfests and club meetings. Each year, one member is recognized with a unique service award for significant contributions to the success of our organization. The St. Louis QRP Society gathers on the third Wednesday of each month at Florissant Valley Community College. Meetings begin at 7:30 pm. in the ham shack located on the second floor of the Engineering Building. The club hosts a local net on first Wednesdays, at 8:00 pm on the 145.33 repeater. Annual membership dues are $12.00, prorated monthly for those joining during the year. For additional information contact any member including: W0NVM, Andy (314-997-6473); KC0PP, Keith (314-946-5346); NO0G, Gordon (314-739-7124); WB9FLW, Pete (618-288-5432)

About QRP

[Reprinted with permission from the St. Louis QRP Society]

What is QRP?

This "Q Signal" for reduce power has come to represent the amateur radio tradition of using minimum power to establish and maintain communications. The international standard is 5 Watts output on CW and the digital modes or 10 Watts PEP on SSB. Signing "QRP" after a callsign is not expected though many low power enthusiasts prefer to do so.

Can I Actually Work Stations on 5 Watts or Less?

Yes, and thousands of active QRPer's will be delighted to have you join our ranks. some are absolutely committed to operating QRP. Others run low, medium or full legal power at various times. With reasonable propagation it is possible to work-the-world on QRP. Some hams display a DXCC certificate with a "Milliwatt Endorsement" for achieving this goal with less than one watt output! WAS, WAC and DXCC are earned by low power enthusiasts with simple wire antennas and even indoor antennas. In DX pile-ups or periods of poor propagation, QRPer's substitute skill for power! Adding a rare station to the log after quietly slipping through a wall of KW's can be a satisfying experience for the low power operator. At the same time a QRPer will quickly acknowledge the skills demonstrated by his QRO counterpart in helping to complete a contact.

How Do I Get Started?

One of the most attractive aspects of QRP is simplicity! It is not necessary to purchase new equipment or dedicated QRP gear. Just turn down the drive on your current rig and enjoy the thrill and challenge of making contacts at a minimum power outputs. You may already be running "QRP" without knowing it! The typical low power setting of a 2 meter FM handie-talkie is about 150-300 milliwatts. In the hands of a

sharp operator this same output is effective on the HF bands!

What About Commercial QRP Gear?

Major manufacturers have produced HF radios specifically for the low power enthusiast. A dedicated QRP radio is usually in the "calm operator" category with just enough features and controls for good performance. Ten-Tec continues to produce state-of-the-art superhet QRP transceivers and the firm's early Argonaut gear is still in demand. Other manufacturers are actively supporting the commercial market including MFJ with monoband CW and SSB transceivers. Most recently, Index Labs began offering the down sized nine-band "QRP Plus". Icom, Kenwood, and Yaesu provide technical information to adjust their transceivers for optimum performance at reduced outputs.

How About Homebrew QRP Gear?

A basic, solid-state, one watt CW transmitter for the HF bands can be built in a space as small as one square inch, about the size of a postage stamp! It may be used with an existing transceiver or receiver. Proven designs for a wide variety of QRP equipment are described in *Solid State Design for the Radio Amateur, Understanding Amateur Radio*, the *QRP Notebook, W1FB's QRP Notebook, QRP Classics*, the *ARRL Handbook*, and other widely distributed titles. An increasing number of homebrew projects in QST are written specifically for the QRPer. *CQ Magazine*, *73 Magazine* and *World Radio* regularly include QRP columns or articles. With this in mind, it is not unusual to find a low power operator running a complete homebrew QRP station! The thrill of the first contact using a hand-built "peanut whistle" is a treasured memory for many hams, ranking with the first QSO as a novice! However, no one is criticized for choosing to run commercial QRP gear or powered down QRO equipment.

Other Comments?

Most QRPer's operate CW but SSB and digital modes are also represented in the low power fraternity. Even at 5 Watts output, 12V batteries are good for long hours of operation. Some QRPer's choose solar panels to charge batteries or power stations. QRP equipment is inherently portable! It is routine procedure to take a station along on vacations, camping, business trips or mobile. a certain camaraderie exists among QRP homebrewers! Creative ideas or improvements in existing designs are willingly shared with others through widelycirculated club newsletters, amateur radio publications and on the Internet. Nationally, a growing number of kit suppliers support the QRPer including Oak Hills Research, Small Wonder Labs, Tejas RF Technology, A & A Engineering, 624 Kits, S & S Engineering, Kanga U.S., and Wilderness Radio. Far Circuits sells printed circuit boards for most popular QRP projects. The New England QRP Club and NorCal QRP Club periodically offer kits to their members. both organizations pioneered inexpensive yet technically sophisticated QRP transceiver projects. The 40-40, NorCal 40 and Sierra designs have been transferred to commercial purveyors and are now available to all amateurs. Kit pricing is competitive when compared to commercial equipment while offering the satisfaction of home construction. For the ham on a limited budget, homebrew QRP gear offers an opportunity to get on the HF bands with a respectable signal at minimum cost. For the seasoned ham bored with "push-button" communications, QRP has the potential to rekindle the excitement and challenge offered by our hobby in earlier days.

Where Can I Find QRPer's?

Locally, the St. Louis QRP Society averages forty to forty-five members. Our club is somewhat unique in that it accepts members only from the immediate metropolitan area. When SLQS organized in 1987, the low power community was already well served by two National QRP clubs. It was not our intention to compete and this initial policy continues today. Active memberships in today's regional and national clubs number from a few hundred into the thousands! ARCI maintains active national HF nets. A

good one to monitor for information is the Transcontinental Net (TCN), 14.060 MHz, Sunday at 2300Z. This net offers interested observers an opportunity to assess the reliability of low power signals across the country and occasionally DX. Enthusiasts in the midwest can monitor the Michigan QRP net, 3.535 MHz, Wednesday, 0200Z. All operators are cordially invited to QNI on any low power net. At other times, QRPer's can be found anywhere on the HF bands. However, here are some frequencies where we like to gather to work other low power enthusiasts: CW: 1.810, 3.560, 7.040, 10.106, 14.060, 21.060, 28.060. SSB: 1.810, 3.985, 7.285, 14.285, 21.385, 28.885. Novice or Tech Plus: 3.710, 7.110, 21.110, 28.110.

Are There Many Other QRP Organizations?

About thirty exist world-wide and the number is growing! Among the most active and well-known in the U.S. are the Amateur Radio Club International (ARCI), Michigan QRP Club (MI-QRP), Northern California QRP Club (NorCal), New England QRP Club (NE-QRP), NorthWest QRP Club (NW-QRP) and the Colorado QRP Club (CO-QRP). Many U.S. hams also belong to the G-QRP Club of Great Britain, legendary for on-going efforts to promote homebrewing. All of the above clubs publish excellent quarterly newsletters emphasizing construction projects and reporting operating experiences. Annual membership fees are very reasonable. Each club issues a lifetime membership number to document awards and confirm contest exchanges. The QRP column in the January issue of World Radio is a good one-stop source for specific address and membership information about most major QRP organizations.

What About Contesting?

Many QRP clubs sponsor contests for both CW and SSB enthusiasts. Bonus points are usually available for homebrew gear, battery power or natural power. Some national and international QRO contests offer a low power section. Dedicated QRP contests are typically more relaxed than QRO events. Emphasis is placed on operating skills and good fellowship along with serious competition. CW ops may be pleased to learn that code speeds generallyrange from 10-20 wpm in these events. QRPer's will make a significant effort to stay with a contact until the exchange is completed! There is a growing trend towards "milliwatting" in QRP contesting. Operators accepting this special challenge are eligible for additional bonus points or an option of competing in a separate power classification. "Sprints" with a typical duration of four hours are very popular form of contesting for the QRP community. An on-going "Fox Hunt" contest has recently been organized by QRPer's frequenting the Internet.

What About Awards?

The clubs mentioned earlier offer a selection of wall paper which may include "Worked All Members" and QNI. The standard WAS, WAC and DXCC certificates are available as well. Acknowledging the challenge of attaining awards at low power, several can be earned in stages. Special endorsements are available for awards achieved "2 X QRP" and a "1000-Mile-Per-Watt" certificate is highly prized. The ARRL provides QRP endorsements in some categories.

Is QRP On the Internet?

The QRP-List has been on-line since 1993. To subscribe, send a request to "listserv@lehigh.edu". Type only "subscribe qrp-l" "your first and last name" "your callsign" (omitting quotation marks) in the body of the message and save. Confirmation is sent promptly and messages commence shortly thereafter. This is an active gathering place for new and veteran low power enthusiasts with 800 plus subscribers reported. The GQRP-List and Bikeham forums are also popular. Archives for QRP, homebrew, and related topics may be located through periodic bulletins on the QRP-List.

Dayton Activities?

The ARCI sponsored "Hospitality Suite" at the Days Inn South is a legendary part of the Hamvention for the low power

community. Many examples of commercial and homebrew equipment are on display. Portable QRP stations are activated during the evening hours. Several major QRP clubs and low power purveyors maintain sales and information booths in the commercial area. Other related activities include "QRP Forums" (all three days), the "QRP Banquet" with guest speakers (Friday) and "Pizza Night" (Saturday).

Are There Any Surprises When Running QRP?

Yes and no, it really depends upon your outlook and expectations! QRPer's learn the virtue of patience rather quickly. Contacts just don't seem to come as easily as they did before. Operating skills that peaked in earlier days may need to be refreshed and polished. Improvement comes with practice and being there "first with the least" can become very addictive for the low power ragchewer, contester or DXer. The fledgling QRPer may discover an unusual number of hours are again accumulating on the bands making new friends and having fun with our hobby. Time devoted to tweaking an antenna farm to squeeze that last milliwatt out of a fleapower rig is exceeded only by time spent reviewing the latest propagation charts or monitoring WWV reports. A desire to buy the latest commercial transceiver with all the "bells and whistles" seems to diminish just a bit. A few hours must be devoted to brushing-up on radio theory and soldering technique as a decision is made to homebrew that first piece of gear. Consequently, fleamarkets take on a whole new meaning as that odd box or bin is searched with a critical eye for desirable components. The new low power operator learns to graciously acknowledge the abilities of a QRO station pulling out a weak signal or sending a realistic 599/59 report. Finally, in the best traditions of amateur radio the QRP enthusiast accepts good natured needling from QRO friends finding it difficult to understand the challenge and satisfaction of running just enough power to getthe job done. If you can live with these "surprises", come to a St. Louis QRP Society meeting. You'll find lots of sympathy and company! CU SN OM/YL

A REGENERATIVE RECEIVER

by Paul Harden, NA5N
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[Reprinted with permission from "The Peanut Whistle", Journal of the St. Louis QRP Society, November 1995]

I have been fascinated by regenerative receivers since the first one I built in the early 1960's - the receiver that opened the world of short wave to me at a young age, and probably what launched me on a career in electronics and a ham ever since. Even with 1R5 vacuum tubes now long gone, I still find myself building a regen now and again, experimenting with different bipolar and FET transistor circuits. Last year in *Electronic Design News* (EDN), there was a simple regen receiver that caught my eye.... a simple circuit, but implemented slightly different than circuits I've seen before. So, I built one, and it worked as well as the fancier FET versions I've built. Making a few of my own modifications, such as using an LM386 IC for better audio gain, I called it the "PipSqueak". So impressed with the circuit, I called the author at Analog Devices, Charles Kitchin, who turns out to be a ham and an avid low power builder, N1TEV.

I then built another "Kitchin" detector with a front-end preamp for more RF gain and other embellishments. I called this one the "Desert Ratt". This one works so well, I listen to it several times a week... the BBC World News primarily.... from the speaker, while doing other things in the shack. But it's always been a kinda private endeavor -

building regen's just isn't the sort of thing you want to brag about to fellow QRPers.

Then one day on the QRP-L internet group, Dave, NF0R asked about the article and I could not resist but to respond. It was time to come out of the closet and admit, I too, build regens. This started an enjoyable relationship with the SLQS and Dave, mostly through email and regular mail. Dave has since sent me a few goodies from the SLQS parts bin and I offered to build a regen receiver for the St. Louis Club, based on these parts. This includes the famous St. Louis variable caps of the tuner fame, an LM380 audio amplifier board and S-meter. That project has begun and when completed, will be Part II of this series. Prototyping has begun and I'm excited about finishing the "rig". It will be a general coverage shortwave receiver with a switch for the 40M band and coil data for the other popular QRP bands. IT will have sufficient audio to drive a speaker and will even have an "S" meter! all this with 4 transistors and the LM380 audio board. Dave and I have decided to call this SLQS regen receiver the "Howlie Crafters". (If you don't get it ask an old timer.)

In the meantime, warmup your soldering irons and try building either the "PipSqueak" or "Desert Ratt" contained herein. Both are very simple circuits, easy to build, using virtually any construction method from "Ugly" to "Really Ugly", like mine.

WHY BUILD A REGEN?

Regenerative receivers were the first generation of radio receivers used by hams, back to the days of Armstrong. Even though built today with semiconductors, they still have the original "sound" and romance of their turn-of-the-century cousins. They are much different from the ease of a superhet: they take some practice and skill to operate, but once a station is properly tuned in, you'll be amazed at the gain and how well it sounds for a single transistor stage. It will send you back to the old days of radio... is that the SOS from the Titanic? Regens have a charm of their own and can entertain you for hours.

From a project point of view, they are an ideal project. First, they're almost a fail safe circuit, guaranteed to work almost no matter what. All parts (except the variable capacitor) can be bought at Radio Shack for about $10; if you have a junk box of parts, you probably have everything you need. Due to its low parts count, you can build it about any way you choose. Fancy perf board, copper clad board, pretty or ugly. If you've never built anything from scratch before, try a regen circuit. Just figuring out how to solder everything together and build the thing mechanically is fun in itself.

On the practical side, just think of the electronics you'll learn. Even though it's a very simple circuit, over half of the basic circuits used in electronics are there.... tuned circuits, RF amplifiers, oscillators, audio amplifiers, biasing transistors, diode rectification, interstage coupling, dc bypassing, etc. Build one, poke around the circuit with a DVM, change a component to a different value and see what happens. You'll be ready to upgrade in no time -- or your money back! You can learn how this stuff really works and you'll never forget it.

HOW THE CIRCUIT WORKS

Q1 is basically a Hartley oscillator circuit, the kind with the tapped coil. The current through Q1 is controlled by Pot R1. With sufficient current through Q1, enough energy will flow through C3 to sustain oscillation. The objective is to increase R1, the regeneration control, just to the point of oscillation. At this point, Q1 becomes a very high gain, hi-Q amplifier, with gains >100,000 not unusual. Any signal on the antenna, at the resonant frequency determined by L1 and C2, will be amplified by Q1. However, when Q1 breaks into oscillation, it will mask the RF signal. Setting R1 for maximum RF gain without inducing oscillation is critical, but once achieved, tremendous gain occurs. The amplified RF signal is detected by D1 to recover the audio. It is capacitively coupled to Q2, an audio amplifier. Q2 will conduct with a base voltage >0.6V. R4 biases the base at about

1V to ensure constant conduction (the definition of a Class A amplifier). Thus, the small voltage variations on the base from D1 will be amplified. R5 is the collector load, where the amplified signal is developed. It is tapped off by R5. the volume control and capacitively coupled to the LM386. C8 can be any value >1uF; the larger the value, the lower the frequency response. The gain of U1 is determined by C9. With no C9, the gain is 26dB, sufficient to drive earphones; 10uF will produce the maximum gain of 46dB, sufficient to drive a speaker. A value less than 10uF will produce an intermediate gain. The output audio is applied to the speaker (or phones) through C10. Like C8, it can be any value >1uF.

Charles Kitchin uses D2-D4 to establish a very stable voltage for the Q1 regen stage, which makes this circuit very stable compared to others I have built. A 0.6V drop occurs across a diode junction, such that D2-D4, with limiter R3, forms a 1.8V voltage regulator. C6 stores this voltage while C5 keeps the RF out of this dc bias. It provides for a very smooth regeneration action.

WINDING COIL L1

Another beauty of building a regen is winding your own coil and I don't mean a toroid! Good old fashioned coil. Kitchin recommends a 35-mm plastic film case, which works quite well; I use IC shipping tubes with equal success. Here's where you can be real creative. Just don't use anything that's metallic. L1 consists of 15 windings for the RF part and 5 windings for the "tickler" part. With a 200pF variable cap for C2. this produces a frequency range of about 6-16 MHz. Your mileage will vary. Experiment with different number of windings. The rule of thumb is for the tickler winding to be about 1/3 of the RF winding.

SOME CONSTRUCTION HINTS

The circuit can be built almost any conceivable way. Keep the RF components as close to each other as you can, however. It is best to build the circuit on a piece of wood, as a metal chassis causes lots of hand capacity effects. Do not put a metal case over your finished radio.... it can keep L1-C2 from oscillating. The LM386 is carried by Radio Shack for $1. I recommend you also get an 8-pin IC socket. It makes soldering things together much nicer without the chance of overheating the IC.

You will find this circuit to be very tolerant of circuit values. If you are using junk box components, just come as close as you can... it will likely work. R1 can be 100K or greater; R5 can be 2K to 10K; C1 any small value. C3 and C4 must be the same value, but can be 700pF to 1500pF (= .0015uF). Q1 and Q2 can be any NPN transistor, although a high Hfe and high FT works best.

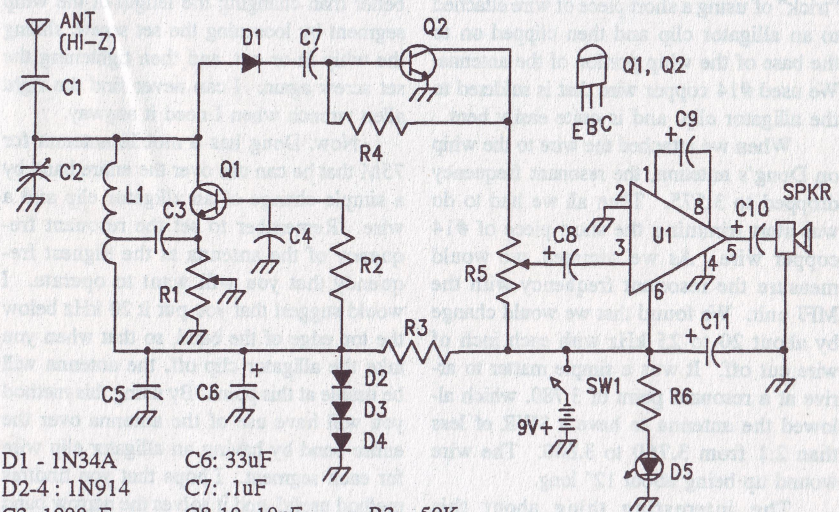
If you're a new builder, I recommend you build the audio portion first. Power it up, R5 to maximum and you should hear a slight hiss. A touch of the finger to the base of Q2 should produce a hum. Then build the regen stage. When completed, power it up again and advance R1. Towards maximum, you should hear it start to "squeal". It's working. Attach to a wire antenna (not 50-ohm coax). A 12 foot wire or more works great.

OPERATION

Turn on the receiver and advance the regen control until you hear a squeal. Back off to just before it squeals, or oscillates. As you tune C2, you will hear occasional squeals. These are usually stations. Stop and adjust R1 for proper regeneration. For the international broadcasters, such as the BBC or Radio Nederlands, their powerful signals gives good starting practice on proper tuning. This is aggravated by an effect called "pulling". This is where you advance the regen control for proper amplification and the received frequency will pull downwards a bit. It's a two handed operation jiggling both the tune and regen controls. But you'll quickly learn that regens indeed have a charm and romance of their own. GL es 72, Paul NA5N

"PipSqueak Regen Rcvr"

NA5N



D1 - 1N34A	C6: 33uF	
D2-4 : 1N914	C7: .1uF	
C3: 1000pF	C8-10: 10uF	R3: ı50K
C4: 1000pF	C11: 33uF	R4: 470K
C5: .01uF	R2: 100K	R6: 750

TUNE YOUR HAMSTICK THE EASY WAY

by Lloyd Bennett, WA0WOD
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Northglenn, CO 80221

Many hams have taken advantage of the Hamstick mobile antennas. They are cheap, easy to mount, and they work. The only problem with them is their relatively narrow bandwidth, typically 35 to 40 KHz. I was in California this spring visiting Vern, W6MMA and while I was there, Doug, KI6DS came for a weekend of QRP hamming. Saturday we worked the NorCal QRP contest, and then on Sunday we drove to Livermore for the Swap Meet and then followed by going to the monthly NorCal Club meeting at the "California Burger". Doug purchased a 75 meter Hamstick at the swap to go with his mobile setup. He is using the Cascade and the Epiphyte in his Toyota pickup, and wanted a simple mobile antenna system.

When we got back to Vern's house, we decided to set up the 75 meter resonator. It was going to be easy, because Doug has one of the MFJ249 antenna analysers. The MFJ unit is really handy. All that you do is hook the coax from the antenna and then dip the meter for resonance. The unit has a built in frequency counter to read the resonant frequency. When Doug tried his unit, the resonant frequency was at 3.950. That was much too high, as he wanted to operate from 3.760 to 3.800. The instructions that came with the antenna said to add a capacitor to the mount to lower the frequency. Doug did not want to do that as he uses the mount for other bands. He was upset, and not a happy customer.

It was then that I remembered an old trick that someone taught me years ago. It is a simple way to change the resonance of the antenna, and it works. We all know that if you lengthen the antenna. you will go

down in resonant frequency. The trick is to do it simply. Doug did not want to add on to the length of the whip. So we used the "trick" of using a short piece of wire attached to an alligator clip and then clipped on to the base of the whip portion of the antenna. We used #14 copper wire that is soldered to the alligator clip, and is quite easily bent.

When we attached the wire to the whip on Doug's antenna, the resonant frequency dropped to 3.575. Then all we had to do was start trimming the short piece of #14 copper wire. As we trimmed, we would measure the resonant frequency with the MFJ unit. We found that we would change by about 20 to 25 kHz with each inch of wire cut off. It was a simple matter to arrive at a resonant point of 3.780, which allowed the antenna to have a SWR of less than 2:1 from 3.760 to 3.800. The wire wound up being about 12" long.

The interesting thing about this method, is that you can have several alligator clips and wires, all cut to different lengths for different portions of the band. Then when you want to change band segments, all that you have to do is simply change the alligator clip! This works much better than changing the length of the whip segment by loosening the set screw, sliding the whip in or out, and then tightening the set screw again. I can never find the right allen wrench when I need it anyway.

Now, Doug has a mobile antenna for 75M that he can use over the entire band by a simple change of an alligator clip and a wire. Remember to set the resonant frequency of the antenna at the highest frequency that you will want to operate. I would suggest that you put it 20 kHz below the top edge of the band, so that when you take the alligator clip off, the antenna will be usable at this point. By using this method you will have use of the antenna over the entire band by having an alligator clip wire for each segment. I hope that you findthis method useful, and it solves the narrow band width problem of the Hamstick antennas. 72, Lloyd, WA0WOD

BRINGING THE WILDERNESS TO MR. WILDERNESS RADIO (aka DOING THE CALIFORNIA QSO PARTY FROM GLENN COUNTY)

by Bil Paul
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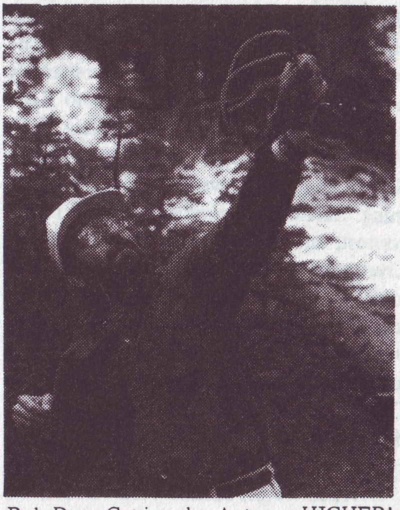
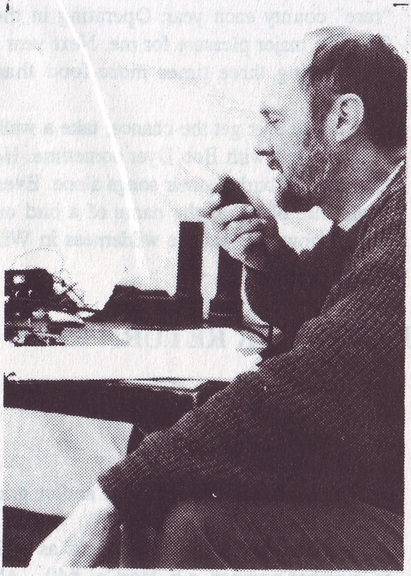
As far as I knew Bob Dyer and I were the only campers at Plaskett Meadows Campground when the wolves started howling at the full moon around midnight.There was a regular chorus of them and they sounded too close for comfort. At least the tent was zippered tightly shut. The next morning Bob said they were coyotes. OK, not so bad— kind of like skinny dogs.

Bob, you see, is a naturalist. Through and through. Specializing in birds. And, being that he runs Wilderness Radio (which is selling theNorCal Sierra, etc.) he thought it a good idea to take a hamming sojurn in the woods. We were at Plaskett Meadows Campground (6,000 feet up) in the coastal mountains about due west of Chico, next to a small lake.

This was in early October and overnight



Bob Dyer Getting the Antenna HIGHER!



Bil Paul at the Mike on 20M

temperatures were near freezing. We had come to represent Glenn County in the California QSO Contest, wherehams try to work every county in the state. I had figured Glenn County had such a meager population it would need some hams.

The start time for the contest arrived on Saturday morning and we had our inverterted V (for 20/30/40 meters) and G5RV antennas up. OK — a confession— we were running 25 watts with a Ten Tec Scout. In a contest with lots of big guns, that's like running QRP. This was my first participation in a contest ever — Bob had some experience.

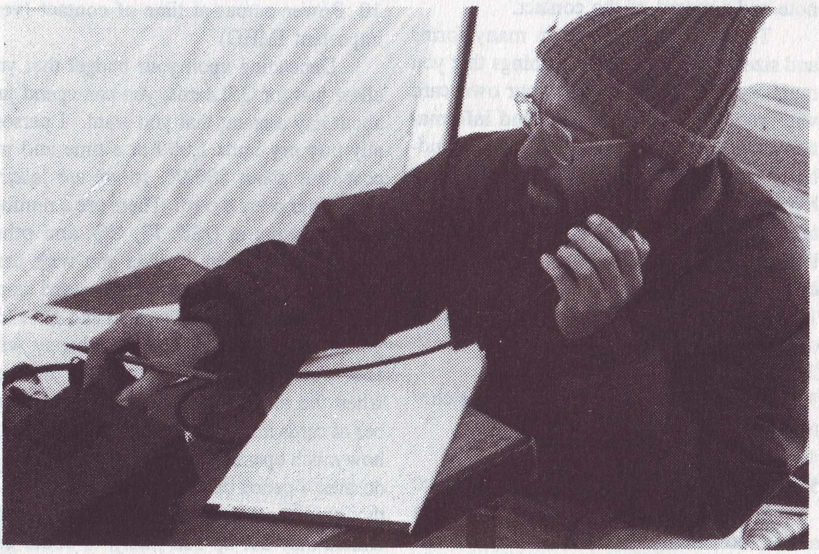
We had decided to do this for fun,not to try to rack up big scores. We had just started to make contacts on 20 meters ("What county?" "George-Lima-Echo-November-November — Gla-enn County — QSL?") and the day had just started to warm up when Madame Ranger showed up. She was all bustle and business.

"You can't camp here. This is the picnic area. The camping area's across thelake."

"Oh. We must've missed the sign. But look at this big tent and all the antennas up in the trees. Can't we stay here just one more night?"

"Sorry. Stay and I'll cite you."

In the end we compromised. She let us plop our stuff in the back of her pickup for a quick ride around the lake. By this time we were getting very good at setting up the monster tent. Now we had water. And neigh-



Bob Dyer, Mr. Wildernous Radio, at the controls of a Scout!! GASP!

bors.

The inverted V went back up (improved for this trip with a balun and RG8X coax). Bob put up a full-wave delta loop for 40 meters, which eventually brought us Japan.The results: around 70 contacts. Lots of fun. I learned some contesting basics and how to use cut up logs for stools.

Broadcasting at night by candlelight is cozy. I think I'll make this California QSO party trip an annual affair — to a different "rare" county each year. Operating in the field is a major pleasure for me. Next year I won't bring three times more food than needed.

If you ever get the chance, take a walk in the woods with Bob Dyer sometime. He can ID most birds bytheir songs alone. Even his license plate has the name of a bird on it. And now he's put the wilderness in Wilderness Radio. 72, Bil

QSL CARDS: HOW TO INCREASE YOUR RETURN RATE

by ChuckAdams,K5FO
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All hams in amateur radio should know what a QSL card is.The QSL card has been around almost from the very beginningof amateur radio. The ARRL in the latest Handbook defines a QSL card as a postcard that serves as a confirmation of communication between two hams. I consider the card to be both a paper trail for the QSO or contact in the case of a contest and also to be a courtesy extended by oneham to another. Not unlike a handshake between old friends and new friends. It is a thank you note and a record of the contact.

The QSL card comes in many forms and sizes, but there are some things that you must consider when getting your own card with your very own call sign and information on it. The ARRL in the 1995 Handbook says in Chapter 2 that the card must have a minimum of the following information for it to be useful for award qualification for their many awards. The minimum card must have:

1. Your call sign, street address, city, state or province and country
2. The call of the station worked
3. The date and time (in UTC) of the contact
4. The signal report
5. The band and mode used for the contact.

In addition to the required information above most hams will addsome additional information such as

6. County name if in the USA and/or grid location for VHF work
7. Logo(s) for clubs, state seal, etc. as well as member number, e.g. NorCal #40. All the printers have the most popular logos such as ARRL and some even have the QRP ARCI logo available to put on your card. Mine has the ARCI logo occupy the upper left quadrant of the card.
8. List of awards won such as WAS, DXCC, WAC, etc.
9. Rig and antenna(s) used
10. Power output at time of contact (very important IMHO)

Depending upon your budget that you allow just for QSLcards, you can spend just about any amount that you want. I personally buy my cards 1,000 at a time and my cost runs about $36.00, so we are talking about four cents a card. There are a number of advertisers in QST, 73, CQ, and other magazines that can provide you with card samples and will even print up a card using your own design. Shop around and get what you want and what you will be happy with and what you think will get you noticed when the other ham receives it. The number of cards that you get should depend upon how much operating you do or think you will do over a period of time. For some people a thousand cards would be a lifetime's worth. Others may use up that many, or could use

that many, just for one contest if they QSL'd one-hundred percent. There is usually a price drop per card as the number of cards ordered at one time from a printer goes up.

Here are some suggestions that I recommend for increasing your returns on QSLs (and I restrict myself here forQSOs between US hams) and others that have experience will tell you some variation of also:

a. Put ALL the information on one side of the card. A lot of hams don't want to have to turn the card over to get other parts of the total information. This can mean the difference between getting a card back or not. Be sure your call is on the card. You can put what you want on the back of the card, such as a photo, etc. or in my case it is blank. It keeps the cost of the card down.

b. Don't go overboard and get too fancy. The KISS principle works here as well as in a lot of other places.

c. Most cards are 3.5"H x 5.5"W (13.9cm x 8.9cm) standard size that you get from printers that advertise in QST and other places. Don't get cute and decide that you can make your card stand out from the rest by making it larger or some off the wall odd shape. Two problems here — you need to find an envelope that'll work or the US PO will charge you extra for being oversize and there is the possibility that automatic sorting machines will pick your card to chew up if you don't put it in an envelope. If the other ham stores cards in a shoebox or card file, your's will not fit and it just might go into the circular file known as the trash basket.You either have to find a design already done and there are many or do one yourself. Here one tends to go overboard with fancy designs. I have gotten all kinds of cards over the years. Some hand drawn, rubber stamped, regular postcard with info filled in and hand written on the back, computer generated dot matrix cards, computer generated laser output, and the list goes on. If you can think of it it has already been done. I think that simple works here as the other ham wants a valid card for possible use for some award.

Here is the typical process from start to finish that works for me and gets me a fairly good return in this day and age.

1. I work a station on the air. I make sure that I get all the information correct — call, name, qth, rst, etc. I carefully put it into the log book. This is the most critical thing of all. If you screwup the call, you are going to QSL to the wrong individual and will not get an answer back or a nasty letter back wondering if you worked a "pirate", another station using someone else's call. This happens a lot in DX work.

2. If you are going to QSL the station and you are not running hot and heavy in a contest such as SS, QRP Afield, QRP ARCI QSO Party, etc. then you should go ahead and fill out the card right then and there. Several reasons for this. The QSO is fresh on your mind and you can note something on the card that will refresh the other persons memory and it makes them feel good that you paid attention to them and it wasn't an ego trip for you. Work on your penmanship if it needs it and do a good job. Do not make an error then scratch through it and rewrite the info on the side. ARRL awards people don't like this. In fact they will accept no cards with modifications or deletions on them. If the band has good propagation and it is not expected to last much longer, then you can and should wait until later to do the QSL paperwork. Work 'em first and QSL later. If the other station was QRP, then indicate so when you place their call in the location on the card with the /QRP after their call sign. They they will appreciate it if they are working on a QRP award. I also will put in a square marked MODE 2-WAY the words QRP CW. On my card I have a place for power output and since I do QRPp only I write it down. It does two things. Reminds other station that I was QRP and sometimes will impress them and they will QSL back. May also get them to remember to put your call followed by / QRP in the call field of their QSL card.

3. Now get the latest address for the station and hopefully they have kept the FCC informed of their current whereabouts. I personally use the internet and use the listserver for the qrp-l group and run the 'calls2dist'

command. This command goes out on the internet and gets the latest FCC information which is usually no more than 24 hours old and the routine also returns the distance from my QTH to that of the other station. This assumes that they are not portable out in the field or traveling. If you have the call wrong, you will immediately spot the wrong QTH or name etc. from the information that you get back. To those new to the internet send email to LISTSERV @LEHIGH.EDU with RUN QRP-L X CALLS2DIST K5FO KI6DS where you substitute your call for K5FO and the other station's call for KI6DS. You will get back their name and address and a calculation of the great circle bearing distance to their QTH from yours. Note: you must be subscriber to QRP-L to do this. I also write on the QSL card the distance that I got. I think that at QRP levels this impresses hams to give them some indication of how far our little signals can go and theirs if they too are QRP.

4. Something that I do and you have to make the call for yourself here. I put the QSL card in an envelope. This just upped the cost from 20 cents to 32 cents to mail it!!! Some can not afford this and I respect that, so do what you have always been doing here. But I do one extra thingy here. I put in the envelope a 3.5"x1.5" peel away label with my mailing address on it done by a rubber stamp. This helps the other person in that they don't have to address their card or envelope by hand. Saves them time and costs me an extra cent or less. I find that I now get a lot of envelopes and cards with that label attached. And I know the address is correct. The reason why I personally put a QSL card in an envelope. I find that about 25 percent or more of the cards that I receive that are not in an envelope have been defaced by some machine within the postal system. I'd like others to let us know how many they get that way.

5. Now with a leap of faith mail the card and place it in the hands of the postal authorities and wait for a reply. Sometimes the other ham will reply immediately, sometimes later, sometimes much later, and sometimes never. It's a gamble here gang.

6. When you do get their card back, mark in your logbook that you received a reply, put it into the computer if you are using some program to keep track, and then put the card into your box. I got a platic shoebox from K-Mart for $2.00 that is clear plastic and has a green lid, but the color was just the color they had and has no special significance. It is 6.5"W by 4.75"H by 12"L on the inside. This box serves two functions at the present time. It holds incoming cards and it holds some of my blank cards and some envelopes. This makes it handy to do outgoing cards and keeps everything in one place. Works for me. It is about to run out of room for my cards pretty quick though. I have a set of cards with tabs A, B, C, through Z, that I use to seperate the cards. Here is the scheme I use. I take the first letter after the number in the call to file under. For instance, K5FO goes under F, KI6DS goes under D, etc. Even for DX calls, the same thing. It pretty much evens out the distribution of the cards after a while. Neato.

As a recent example of how this typically works. During June through August I spent all my time on the air on 30M. This was part of a study of propagation on 30M, since I have been on 40M all my life and 40M is my favorite band. That is, until this and now I work both. I worked 211 stations on 30M during this time period. I have sent out 174 QSLs and will continue to send out more. So we are talking about another $60 in expenses here. I have so far gotten back 97 QSLs. I worked 45 statesand have 42 states confirmed. At the time of this writing I have sent a second card to the 3 stations in the three states that I don't have confirmed. This to test to see if they did not get the first one or are going to bea problem. Next step is to send a SASE.

There are two things that get to me and here they are for your consideration. I have seen someone post on an internet group that they will not QSL unless the other station sends them a SASE. This is inexcusable

behavior in my book. Why should I pay foryour postage? I paid for mine and it shouldn't break the bank to return the favor. Ever think about another hobby? Wonder if this is a ham with a $3,000 dollar station and another $2,000 in an antenna system? Now I have had guys send me a card and an SASE. I return the SASE in my envelope. Let 'em use it somewhere else. I can afford this hobby. I appreciate it but the Golden Rule applies here. And number two. If I need your card bad enough, I'll decide what the hell and send the station another card and a SASE.If the guy doesn't return the favor, then I hope the guy doesn't sleep well at night. What is he doing? Collecting stamps for the next rig? I hope not. At least return it with a note to tell me where to go. That I can understand. There might be a Federal Regulation on this from the US PostalService. Wouldn't that be nice?

And now a happier note and something that I don't do enough. Sit down with the box of cards once in a while and go through them one by one. It'll bring back fond memories of nights and days at the rig with electromagnetic energy going from one placeto another with information being exchanged. That's what it is all about in my opinion, and you did ask. I run across cards of friends that I have made and friends that I have lost over the years. Each memory is precious and hopefully you and I will be remembered long after we are gone because of a small card sent to someone somewhere as a momenta of a QSO carried on by the miracle of radio.dit dit es here's hoping for many QSL returns—Chuck Adams (K5FO CP-60) adams@sgi.com

NOTES ON PUTTING THE CASCADE ON 40 AND 17M

by Jim Kortge, NU8N
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Fenton, MI 48430

As promised, here are my notes from building a Cascade using the 40/17 meter option.

General Comments: I did not follow the modification described by John Liebenrood, K7RO, the Cascades designer. The original procedure requires two 20 meter band modules, one for 40 and one for 17 meters. However, when the PC boards were done for the kit, no additional 20 meter band module boards were manufactured. One could use a blank Sierra board, (Jim Cates has some of these) but I wanted to assemble the kit from the boards that were supplied. Therefore, my modifications will allow assembly using the original 75 meter and 20 meter band boards.

Here is the litany! The first thing which must be done before building, is to correct a mistake in the PC board. Failure to correct this error before installing connector J4 will require later modification to the 75 meter band board. The correction requires cutting away the ground traces on the top side of the PC board, where pins 23 of connector J4 will be. Leave the trace connected between the two pins, but cut the traces to the front and rear of the dual pin holes. Nothing has to be done on the bottom of the PC board at this location. It is correct.

After this step, you can also remove the two ground connections on the PC board pad that is to the right of the rearmost pad for component C89. This component location is right and rear of the area where tuning capacitor C18 will mount. The ground modified pad is used later in the VFO assembly. Finally, make sure that you have the addendum sheet for the Cascade, since I am not covering those changes in these notes. Pay particular attention to the need to add a ground from the back panel to the PC board. In my rig, I actually added two ground points. One near the BNC connector, and one just to the right of C67. Finally, use only silver mica or COG (NPO) type capacitors in the band module boards. Anything else will result in decreased output power, especially on 17 meters.

Section 1, DC POWER, 8V REGULA-

TOR:

Build this section as described in the manual. No modifications are required.

Section 2, BFO:

I have assumed that you have obtained 10 or more 12.288 MHz crystals, but these have not been sorted for use in the filter (Y2 - Y6). Build section 1 per the manual except for the following. Replace R22 with a piece of wire (0 ohms). This will provide more mixer drive. Do not assemble and install the inductor pair L3 and L33. Only one of these parts, L3, is needed with the new 12.288 MHz BFO crystal (More on this later). Install like a resistor, standing up on end. Also, do not solder in a crystal. We need to use the BFO oscillator for sorting the crystals. Here is how that step is done.

Set the PC board on a piece of foam, so it doesn't scootch around on the workbench. Connect your counter, which can resolve +/- 10 Hz, to the junction of R22 and R58. Apply power to the rig, and insert a crystal from the batch into the pad holes where it will eventually be soldered and push down into the foam below enough to hold it steady. Note: Touching the crystal with your fingers during measurement will cause errors. Let it set for 60 seconds or so to stabilize, and then read out the frequency. If it is not near 12.288 MHz, adjust trimmer capacitor C90 to "net" it near our target frequency.

Measure the next crystal, but don't touch the trimmer again. If this crystal is higher in frequency than the previous unit, lay it to the right. If it is lower, lay it to the left. Keep a mental note of frequencies as you go. If your crystals are like the set I was working with, frequency groupings will start developing. Select the 5 crystals with the closest frequency grouping and verify they are with 100 Hz from the lowest to the highest. Out of 10 to 12 crystals, you should get at least one useable group. Out of 20 crystals, I got 3 good sets.

Set aside the 5 crystals that are matched, and solder into the BFO circuit, one of the "unmatched" remainders.

Follow the "Initial BFO Alignment" procedure in the manual, except substitute 12.290 MHz for the 9.001 MHz frequency, and 12.286 MHz for 8.998 MHz. I used the counter attached to the junction of R22 and R58 for this initial alignment.

Section 3, VFO: Build the VFO according to the manual except for C22. C22 changes to a 47 pF NPO capacitor instead of a 270 pF. In addition, follow the 40/17 conversion routine regarding re-connecting the J4 pin 23 ground return. (This is where fixing the PC board error at the beginning pays off.)

The easiest place to get to the junction of C22 and C25 is to connect a wire from the rear, right, open lug on tuning capacitor C34 to the PC board pad. The other step which is required is to connect pin 23 to pin 25 on your 75 meter band board. This board will be used on 40 meters and this modification switches in the extra capacitance to lower the VFO frequency.

To get the VFO to cover the required frequency ranges, I had to add the following parts. These were soldered on the bottom of the PC board in parallel with previously installed components. Add a 10 pF NPO capacitor across trimmer C17. Add a 10 pF NPO capacitor across capacitor C22. Add 220 pF and 22 pF NPO capacitors across trimmer C34. With these changes, my VFO had exactly 200 KHz coverage on 40 (7.100 to 7.200 MHz) and 60 KHz coverage on 17 (18.108 to 18.168 MHz).

VFO Alignment:

1. Set capacitors C17 and C34 to be half meshed position.
2. Set capacitor to fully meshed position.
3. Measure the VFO frequency on your receiver or with a counter, by attaching to the junction of R21 and R57. I prefer this method, since you don't have to keep retuning the receiver as alignment proceeds.
4. Install 17 meter (using the 20 meter) band board.
5. Adjust capacitor C17 so that the VFO frequency is 5.820 MHz.
6. Install the 40 meter (using the 75 meter) band board.

7. Confirm that the VFO shifts down in frequency by approximately 0.850 MHz.

8. Adjust capacitor C34 so that the VFO frequency is 4.988 MHz.

9. Repeat steps 4 through 8 until the both band frequencies come in.

10. With the 40 meter band board installed, confirm that moving the tuning capacitor, C18 from fully meshed to fully open results in 200 KHz of frequency movement.

11. With the 17 meter band board installed, confirm that moving C18 from fully meshed to fully open results in 60 KHz of frequency movement.

Section 4, Audio Amplifier:

Build this section according to the Cascade manual. No changes are required.

Section 5, I.F. and Product Detector:

Build this section according to the Cascade manual except for the following. Change resistors R60 and R61 to 2.2K, for more mixer drive. Change resistor R52 to 10K, for more Tx filter drive. Add a 100 K resistor and 0.01 uF ceramic capacitor on the gate of Q11. This will prevent spurious signal pickup on the gate, leading to frequency offset between the transmit and receive. Use the crystals and capacitor values specified for the 40/17 modification. Either silver mica or ceramic with COG or NPO tolerance will work. I used the COG version obtained from DigiKey. Capacitors Cin and Cout were soldered on the underside of the PC board.

Section 6, Plug in Band Modules:

The 17 meter band module is constructed as described in the 40/17 modification part of the manual. Note that for inductors L2 and L3, a yellow torroid (type T37-6) is used instead of a red (type T37-2). This change will require purchasing two extra T37-6 cores from a suitable source.

The 40 meter band module can be built using the 75 meter band module board with the following changes. Build the Tx Low Pass and Rx Pre-selector sections as described in the 40/17 meter modifications. Build the Tx Spur filter section using the following values. These components go on the 75 meter band board in their original locations, but the values are different. Inductors L4 and L5, 9 turns of #26 on original T37-61 core. Capacitors C3 and C11, use 820 pF values. Capacitor C7, is a 1800 pF value. C5 and C9, 68 pF in each location. The bandwidth of the filter is approximately 400 KHz wide like the original and maintains its 50 ohm termination impedance.

Band Module Alignment:

Use the procedures in the manual. As noted, using these modifications allows using the original 20 meter board for the 17 meter band module, and the original 75 meter board for the 40 meter band module.

Section 7:

No changes required in this sections.

Section 8:

Build as described in the manual, then add the following components. On the bottom side of the PC board, solder a 68 pF ceramic or silver mica capacitor across the primary (collector side) of T1. In a similar manner, solder a 180 pF ceramic or silver mica capacitor across the primary (collector side again) of T3. These capacitors help flatten the response of these transformers, providing more output on 17 meters. A 100 ohm, 1/2 watt resistor should be soldered across the primary (collector side) of output transformer T2 for added final stability when operating into reactive loads.

Sections 9 and 10:

No changes required in any of these sections.

Observations and general notes:

I did the carrier balance on 17 meters, since it seems a bit more sensitive than on 40. I also noticed that setting the PA bias did not exactly follow the manual. I set this by putting the rig on a dummy load, whistling into the microphone, and setting the bias potentiometer until the power output peaks. At maximum CW travel of the PA potentiometer, the power output on my rig actually decreases.

Power outputs are as follows: On 17 meters, just a tad over 4 watts, on 40 meters, I am getting approximately 7 watts. Both of these are under a "steady whistle" (now

there is a new engineering term) into the microphone. I am using an Alinco speaker -mike, part number EMS-2. It is too small for good audio from the speaker section, but the microphone seems to work well.

My rig is apparently the first of the Cascades built for 40 and 17. I am hopeful others take the challenge, and try this. My advice is to not build the rig on 75 and 20 first, since there are many parts which need to be changed. My concern is the damage that probably will be done to the PC board getting the old parts out. I have changed just a few along the way (mostly stupid mistakes) and found that removing them, even using a solder sucker and solder wick, was not easy. I can't imaging doing a major rework from 75/20 to 40/17 and not lifting several pads and damaging numerous traces.

I will also be quite happy to correspond via e-mail to those who are doing this modification and need help and/or advice. Or you can call (810-629-0378, no collect calls please) and we can try that mode.

That's all....have fun with this really great rig! 72, Jim Kortge, NU8N
jokortge@tir.com
jokortge@detroit.freenet.org

Postmortem:

I have done some additional modifications to the rig since the "initial foray". I'm not recommending these changes necessarily, but am supplying them "for information only". Use at your own risk!

I have changed the output transistor in my Cascade to a 2SC1945, which has a different pinout than the 2SC2312. One of the important differences is the fact that the emitter is on the mounting tab, instead of the collector, thus allowing the emitter to be directly grounded to the back panel. This device also is rated for more output (15 watts) than the 2SC2312. However, its use also requires that the collector and emitter leads be reversed, making for some real butchering of the PC board to get it connected.

I've also changed the output transformer, T2 with the change to the new output transistor. It is wound with a 1 turn primary, made from RG174 braid, with the 2 turn secondary threaded through the "tubes" of the braid. This technique is detailed in one of the Motorola application notes. I mounted the new T2 on the bottom of the PC board, so that a 0.01 uF bypass capacitor could be soldered on the top of the PC board from the cold end of the primary (12 volt feed) to ground. I'm still using the 100 ohm resistor across the primary for stability reasons.

With these changes, I am getting the following output powers. 17 meters, steady whistle, 7 watts, and on 40 meters, same conditions, 11 watts. That's about double of what the rig would do with the 2SC2312 and the other output transformer. The 2SC1945 hardly gets warm at those power levels. And yes, I know it's not QRP anymore, but I have my reasons. Read on.....

One of the things that I know from experience (more than 3 years of bicycle h.f. mobile) is that you need at least 10 watts of steady state output (especially on 40 meters) if you're going to make contacts while on the bike. With the very high antenna losses from minimal ground plane and low antenna height, anything below about 10 watts won't get the job done. It's not much fun running h.f. bicycle mobile, and not be able to make contacts! I know, I've been there; done that! With the current power levels, taking the Cascade on the bike is now a reasonable consideration.

So that's the latest! Have fun with your Cascade. It's a very good design, and works quite well. I constantly get complements on the audio quality, and most stations find it hard to believe that 10 watts can sound so strong. I still have a bit of drift in the VFO, and that's the last challenge before the rig is "perfect".

72....Jim Kortge, NU8N

[Editors Note: NorCal is deeply indebted to Jim. He put countless hundreds of hours into the research and development of the mods that you see here. John, K7RO also worked with Jim and credits him with doing the first Cascade on 40M. Thanks Jim. Doug, KI6DS]

CASCADE TOROIDS AND POWER STATUS

by Bruce Florip, AA7AR
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Hi Fellow QRPers. I wanted to give you the results of the last few daysof playing with the Cascade. A few comments have been made about "remove a couple of turns from your torroids" and it was bothering me to think someone may try that without a sort-of-rational reason for picking which torroid to attack...At least as far as the Cascade (and Sierra) go a good indication of proper tuning and associated resonance is the position of the variable capacitors (trimmer caps).

On the Sierra Wayne went to some lengths to make the initial tuning point on the trimmers the half way point. Don't get me wrong, if you've tuned up your radio and the trimmers aren't exactly half way don't worry. The point to worry is when the best amplitude is when the trimmer is either all the way meshed, or all the way open.

On my Cascade, I found the 75 Meter band module had two trimmers in the fully open position. That means the maximum signal may not be due to resonance, only to the minimum position on the trimmer. In each case (and done one at a time) I removed one turn from the associated torroid and was able to tune for maximum signal at other than the fully open position of the trimmer. In my case L5 was reduced by one turn to get C6 into about the 2/3 meshed position, and L4 was reduced by one turn to get C8 to a nearly meshed position (not fully, about 80%).The bad news is that with 13.8 Volts on the Supply, and the 75 meter module installed, I started with 70 V peak to peak on the scope across 52.4 ohms and ended up with the same value after the changes. Not all bad for an evening of fun, and no loss of performance.

Still on the Cascade topic... After helping a couple of others with the post-build tune-up on their Cascades:When you're installing resistors and capacitors, it makes tracing signals easier if you stand the resistors up so the signal end has the long wire instead of the ground end. That makes it easy to get the scope probe in there...Secondly take the time to carefully remove the insulation from each of the leads on your torroids. It's not too obvious visually that there is enamel on the wire after the plated through hole is full of solder.

And, last but not least, if you've been "rude" to your final output transistor on the Cascade. You know, shorted mica washers, bad probing etc. you may find the output stage has very little gain. In one case this was due to the two one ohm resistors in the emitter lead changing from 1 ohm to around 20 ohms each. This can be checked in circuit (with power off) with theDVM just be sure there is less than 1 ohm resistance for the two resistors in parallel. 73, Bruce Florip, AA7AR/6

REDUCED DRIFT FOR THE CASCADE

by Ed Burke, KI7KW
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Lake Oswego, OR 97035

For me, one of the pleasures of using my new Cascade SSB transceiver is chatting with some of the old-timers who hang out at informal nets on 75 meters. But that requires being tuned to a single frequency for a long time, sometimes as much as an hour, and my Cascade drifts during that time as it apparently warms up. So, since I got tired of receiving gentle hints to "retune", I decided to investigate improving frequency stability, and I got out my lab frequency counter.

It turns out, a very major improvement can be made with a few simple changes. In its original (stock) form, the capacitors in the Cascade VFO have a net positive temperature coefficient. As it warms up, the VFO frequency tends to decrease, so the

transceiver frequency (on 75M) increases. What is required, is a negative compensation coefficient from "something".

To make a long story short, after many substitutions, I found that replacing three NPO capacitors in the VFO with polystyrene equivalents helps a lot. I made the following substitutions:

C25,100pf - Mouser 23PS110
C22, 270pf - Mouser 23PS127
C21, 82pf - Mouser 23PS110 (100pf) and Mouser 23PS147 (470pf) in series to get 82pf effective.

These capacitors are the same ones chosen by Wayne Burdick for the Norcal 40 so the improvement should not be too surprising. Mouser's catalog indicates that they have a temperature coefficient of Negative 150ppm/C. The other change I made was to remount the LM383 audio amplifier outside of the box. I used a five-inch length of shielded, four-conductor cable and put the hot audio chip on its own heat sink on the back panel. I drilled a clearance hole through the lower back panel for the cable. This dropped the receive-only power dissapation inside the enclosure from about 1 watt to less than four-tenths of a watt.

When I rechecked my Cascade after making these changes, I found that the VFO drifted less than 30 Hz over 40 minutes with the cover in place. In operation, I am able to tune a frequency and then leave the tuning knob alone; no more retuning every few minutes. Enjoy. Ed Burke, KI7KW

MY RESULTS WITH THE KI7KW CASCADE DRIFT FIX

by Dave Meacham, W6EMD
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Internet: ddm@datatamers.com

Ed (KI7KW) posted a "drift fix" on the QRP-L reflector on January 2. He reported that replacement of C21, C22, & C25 with polystyrene capacitors gave much less drift. I tried the poly fix and got different results initially, but final results are great.

The situation is that the VFO inductor (L1) has a positive temperature coefficient. We are trying to cancel that by putting in negative-TC caps. Well, when I put them in I got OVER-compensation.......75-meter frequency dropped with time (-274Hz in 1hr from a cold start).

I ended up using straight polys for C21 & C22. For C25 I had to use a combination of poly and NP0 caps in parallel.... 82pF poly and the rest NP0 disks under the board.

My Results:

One hour after a cold start the frequency was +4Hz from where it started. This was with a closed case & without relocating the audio chip.

"Your mileage may vary" (Each rig is a little different!) In general, I'd say that you can't go wrong replacing C21 & C22 with polys. You will get a reduction in drift. Beyond that you will need to do some careful testing with a good counter to achieve lower drift.

72, Dave, W6EMD

PEAKING TUNED CIRCUITS WITH A TRIM CAPS

by Ed Burke, KI7KW
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Lake Oswego, OR 97035

With the winter season upon us, you QRP enthusiasts may be planning to build something. So here is a helpful hint. It may have already been communicated, or maybe it is obvious to some of you but here goes....Trimmer capacitors, such as the miniature types used in the Norcal40, Sierra and Cascade, have a capacitance profile that looks approximately like a saw-tooth waveform, with one "tooth" per revolution. That is, if you take a 5pF to 40pF trimmer and set it at its minimum capacitance (5 pF),

and then turn the adjusting slot, it will more or less linearly increase to its maximum value (40 pF) at 180 degrees of rotation, and then linearly decrease back to the minimum at 360 degrees.

So why is this important? Well, when you peak up a tuned circuit which is within range for resonance you should see two peaks for every rotation of the trimmer, not one! Counting two peaks is a pretty good indication that things are working properly, and getting only one probably means that the inductor is somehow the wrong value for the frequency involved. Consider a concrete example. Suppose you have correctly wound a toroid for 5 Mhz such that it will resonate with 20 pF. When you rotate the 5 to 40 pF trimmer mentioned above, it will pass through 20 pF twice, so you will get two maxima. Now imagine that you have made a winding mistake and have produced a toroid which needs 50 pF to resonate. When you try to adjust the trimmer cap it cannot yield more than 40 pF, so it will not really resonate, but you may get an relative peak indication at 40; "I'm not at resonance boss, but I'm doing the best I can". Counting peaks is a pretty good technique when aligning tuned circuits. Enjoy, and best 73's, Ed, KI7KW

THE FORTY-9ER: A 9-Volt 40-METER TRANSCEIVER

by Wayne Burdick, N6KR
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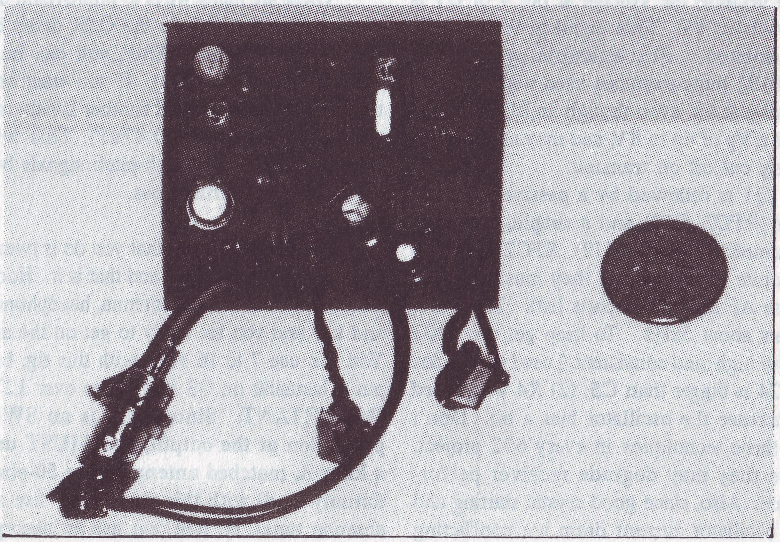
Doug Hendricks found a batch of 7.040MHz crystals, and had no choice but toget someone to design a rig around them. In this article I'll describe a very simple 40m D-C (direct conversion) transceiver that I call the"Forty-9er," because it can run on a 9V battery.

In the spirit of NorCalcollaboration, Doug will do the PC layout, and part with his crystals at some reasonable price. Another motivation for this rig was to improve performance over the D-C transceiver that some of us built at Dayton last year.

The Forty-9er has a few more parts (about 1/3 as many parts as a NorCal 40), but as a resultit is actually usable.



The prototype version of the 49er forty meter CW direct conversion transceiver

Features:

* Runs on any DC voltage from 7 to 12V

* Power output of roughly 250mW at 9 volts, 500mW @ 12V

* VXO covers about 5kHz (7.037 to 7.042 w/7.040MHz crystal)

* Full QSK — really helps when you're using such low power

* Very low current drain: 10mA receive, about 70mA transmit (@9V)

* Only one simple alignment step, and NO toroids

Circuit Details:

Refer to the schematic. U1 is the product detector and VXO. To minimizeAM broadcast and portable phone pickup (both are problems with directconversion receivers), the input tuned circuit has a low L-C ratio. This increases the Q of the tuned circuit, and the small loss in signal is not aproblem.

On transmit, D1 detunes the input tuned circuit and unbalances the mixer, preventing the transmitter from modulating the VXO signal. JFET mute switch Q1 is used to provide full QSK. Q1 must be a low pinch-off voltage type (J309, J310, 2N5484, etc.) because the voltage at pin 4 of U1 is only about 4V. This detail is occasionally overlooked. For example, you'll see MPF102 mute switches used with NE602s running at 6V, even though an MPF102 can have a Vp of up to 8V, and may not be completely cut off on transmit.

Q1 is followed by a passive low-pass filter (RFC2, C10) and a simple, high-gain AF amplifier circuit (U2). RFC2 and C10 are quite large because they must resonate in the AF range (see parts list). The VXO covers about 5kHz. To keep get the VXO output high and consistent, I used two tricks: (1) C4 is bigger than C5; (2) R4 was added to increase the oscillator bias a bit. Don't use these techniques in every'602 project, since they may degrade receiver performance. Also, since good crystal starting and low oscillator current drain are conflicting goals, don't expect to be able to increase the size of RFC6. At somepoint, your transmit power will drop dramatically at one end of the VXO trim cap.

The transmitter has only two stages. The 2N3904 is self-biased for simplicity, and provides enough gain to drive the 2N3866 to around 200mW.

The final operates class C, and is reasonably efficient. I could have used a class A final amp stage instead and possibly eliminated the low-passfilter, but I wanted to minimize current drain. This is a good strategy for operation from a 9V battery, which may provide only a hundred milliamperehours (higher with alkaline or lithium).

Sidetone is not included, since it would have added another five or six parts. You can hear a soft buzz when you key the rig, though, which is acceptable if you're using a push-button key.

Construction:

If you use your own PCB or breadboard layout, here are some things to keepin mind:

(1) in general, keep the RF chokes a good distance apart, or ifyou can't, use toroids;

(2) keep lead lengths short;

(3) use as much groundplane as possible.

There are many ways to improve on the design. You can change the QSK delay by changing C8 (with .002uF, you can hear between dits at 15WPM). If you want better low-pass filtering, add another L-network after C10 (82mH and0.47uF). This will improve rejection of high-pitch signals but will increase insertion loss.

Operation:

To align the rig, all that you do is tweak C2 for the loudest signal and that is it. Hook it up to a power source, antenna, headphones and key and you are ready to get on the air. You can use 7 to 16 volts with this rig, but put a heatsink on Q3 if you use over 12V. **IMPORTANT: Since there is no SWR protection at the output, you MUST use a known, matched antenna (or a 50-ohm dummy load) with this rig.** If you use an antenna tuner, be sure you use an absorptive-type SWR bridge so that the final will see a reasonable load during tune-up. In-

line SWR bridges provide no protection for the final.

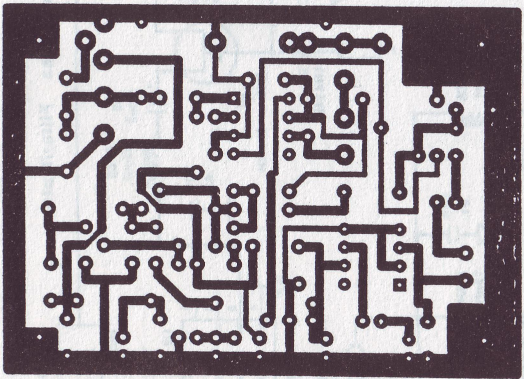
The frequency shift from receive to transmit is very small—typically 100Hz. The shift is in the downward direction, so when you call a station, make sure you're listening on the HIGH frequency side of zero beat. (There are two places you can set the VXO cap to listen to any particular station; use the lower-capacitance setting and you'll be on the high side.)

The rig can be used hand-held with a push-button code key. In the field, you'd just hook up a 33' piece of wire and toss it into a tree, and toss out a ground radial of the same length. Use #22 or larger stranded copperwire and a small, smooth fishing weight. Bring a backup antenna in the event that your tree was hungry.

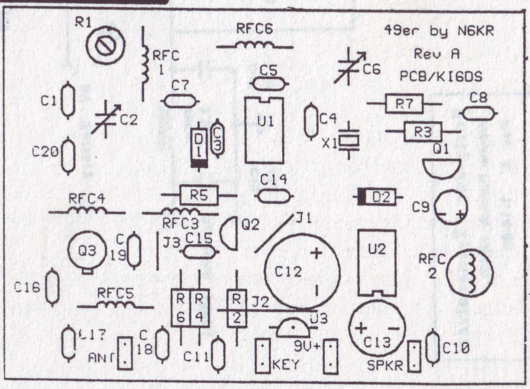
Conclusion:

It's a nice change to build something so simple, and it really seems towork. On the day I built it, I worked Washington state and Michigan, both on the first call! It seemed deceptively easy, so I suspect conditions were good. This is a good rig to take for emergencies or just for fun wherever you're going, since the whole station (including antenna wire and fold-up stereo headphones) will fit in your pocket. The design is still preliminary, so please send me your comments and suggestions if you build one. (I can be reached by e-mail at burdick@interval.com.)

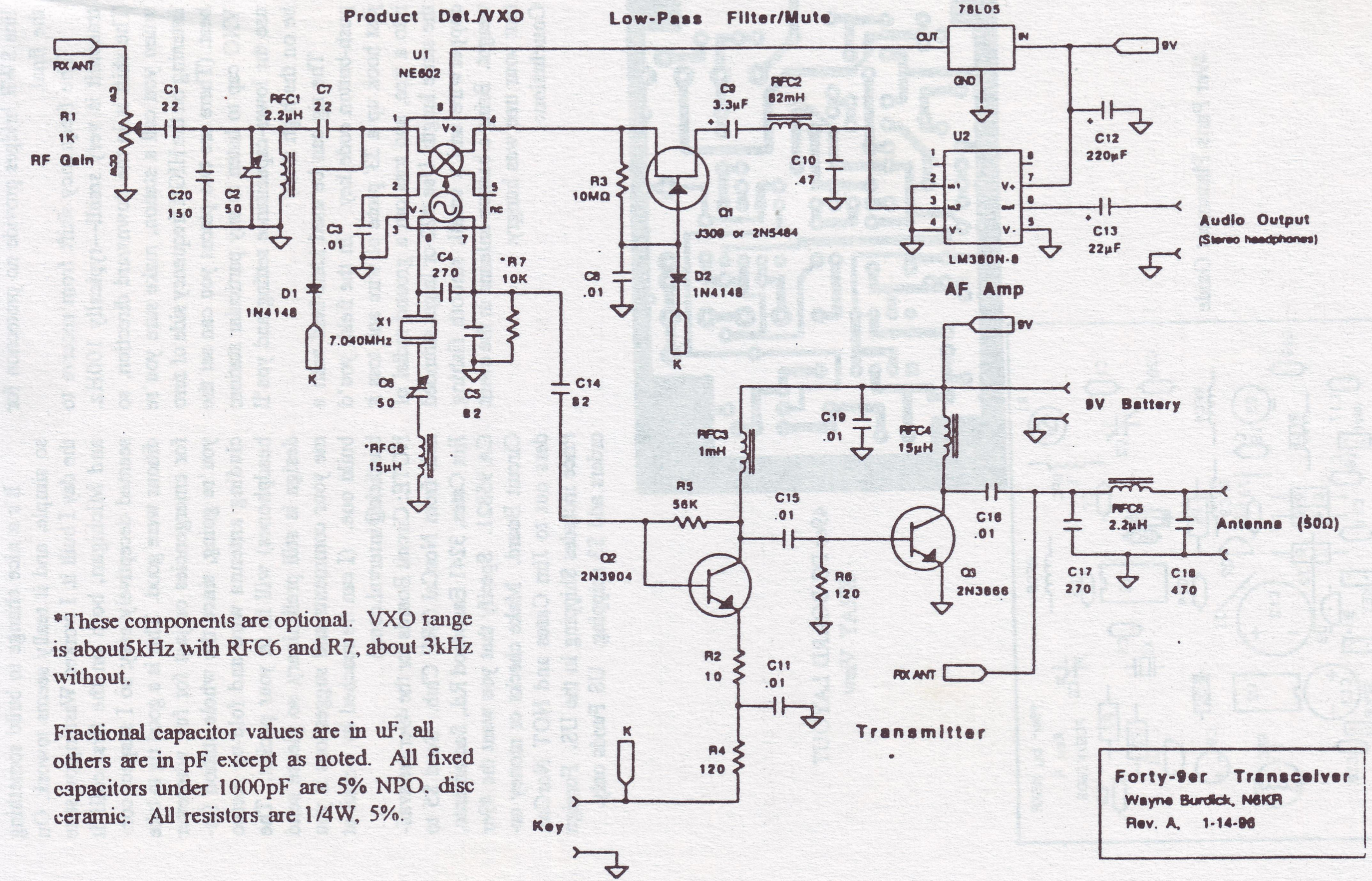
NOTE: Circuit Boards for the 49er are available from NorCal QRP Club. Send $5 to Jim Cates, 3241 Eastwood Rd., Sacramento, CA 95821. Specify that you want the 49er Circuit Board. Make checks or money orders out to Jim Cates and NOT NorCal. Price includes Shipping in the US. Foreign orders add $3 shipping. US Funds only.



49er PC BOARD LAYOUT
XRAY View



49er Parts Placement Guide



*These components are optional. VXO range is about5kHz with RFC6 and R7, about 3kHz without.

Fractional capacitor values are in uF, all others are in pF except as noted. All fixed capacitors under 1000pF are 5% NPO, disc ceramic. All resistors are 1/4W, 5%.

A REVIEW OF THE NORCAL SIERRA (WILDERNESS RADIO VERSION)

by David Yarnes, W5RMZ
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I've had my Sierra up and running for about 10 days now (including band modules for 80,40,30, and 20). Certainly not record time (nor was I trying for such), but pretty good for me—particularly considering a severe case of the flu which I can't seem to completely shake. I am not contemplating a K5FO type report (aren't they great!), but I did want to pass on my brief comments. I had hoped to have some juicy DX QSO reports to throw in, but with the absolutely horrible conditions we have been having lately I don't have that much to offer. I have worked Japan OFTEN on 40 meters with this rig, so it does do DX!

The kit went together very smoothly. No missing parts—no confusion in the instructions. The board is super, just like the 40A's board. The parts are relatively easy to identify, and everything just slips right into place.

There really isn't anything that slows you down or gives you any kind of problem with one small exception. As previously reported, the VFO toroid, L7, appears to require 1 or 2 less turns than called for (2 in my case, 1 in the other reports I saw here on QRP-L). No big deal!!

The band modules are very straight forward—A little dull perhaps due to the number of toroids you have to wind—but easy. Actually, it's not that bad even considering the toroids. Trust me! Winding those things (at least for this kit and for the 40A) is EASY! Each module takes about one and a half hours to complete. Every one of my band modules worked just fine without any problem.

When I first completed the Sierra, and had a band module ready to go, I quickly discovered I had a problem. Fortunately, not a big one as it turned out. I couldn't get anything on receive. I discovered that applying pressure to the top of the band module brought the receiver to life. Obviously I had a bad connection somewhere. I started checking solder connections, and quickly found a bad one. A little reapplication of solder and bingo, I was in business! That is the sum total of the problem list.

I have run side by side comparisons with my Ten Tec Argo 556 and an OHR Classic. The Sierra compares very favorably. My 40A is out on loan or I would have compared it too. Of course the Argo is a different class rig—synthesized, CW and SSB, etc. The Classic is a closer comparison, although it is a duo bander (40/20) while the Sierra is multi band using changeable modules. The Classic does have a big brother that is a 4 bander, which from my observation is very similar otherwise. The Classic is a very solid QRP rig with which I am well pleased, so I felt I was giving the Sierra some stiff competition.

The Sierra hears just about everything the other two transcievers and hear as best as I could tell, and it has a "softness" in the audio quality that allows me to tune across the band without having to ride the gain control. I notice, especially on the Classic, that I have to constantly adjust the gain to keep the audio from becoming too shrill. This is the price you pay for slightly sharper filtering on the Classic. The variable bandwidth feature on the Sierra is a big plus, especially if you move the control to the front panel (which I haven't done yet, but will). Also as previously reported, if you open the variable bandwidth control, it tends to allow reception of the opposite sideband.

The Sierra is rock solid almost immediately. I notice some early drift on the Classic. (The Ten Tec Scout/Argo is supposed to have the shifting problem due to the xtal oven process, but I haven't had much problem in that regard). The sidetone is definitely better on the Sierra than on the Clas-

sic.

The real disadvantage to the Sierra (to some people) is that it is only 2 watts more or less (just about 2 in my case). I must admit I wish I had the other 2 or 3 watts sometimes, but the Sierra is a backpack rig while the others definitely don't qualify.

The frosting on the cake is to put a KC1 in this rig. I think it's a crime if you don't! This is such a "neat" add on, and you need a keyer anyway don't you? Having frequency readout in CW and a message memory as extras is just too good to pass up. By the way, the keyer is excellent and substantially programable in case you haven't seen the specs before.

This rig works great. I recommend it highly. I don't get a damn thing for saying this except the possible satisfaction of having some more people with whom to compare notes. I greatly admire the things Wayne Burdick is designing. To a bean counter like me, this guy's a marvel! Fact is though, I think some of you who know a lot more than I do think so too.

If this rig interests you at all, buy it! you won't regret it.
72 de David W5RMZ

[!NOTE: The Sierra, NorCal 40A Rev. B, and the KC-1 Keyer kit can all be purchased from Bob Dyer at Wilderness Radio. His phone number is: 415-494-3806. Please call for current pricing and availability. At the time of publication all kits were in stock and ready for immediate shipment. Wilderness Radio is not connected with NorCal QRP Club, the information provided here is done so as a service to our readers. Doug, KI6DS]

The QRP Lament

by Arvid Hamer, WA6UUT
992 Echo Dr.
Los Altos, CA 94024

[This poem was presented to Bob Dyer, KD6VIO, upon his retirement from being the EMARC Club president at the club's annual banquet in January of 1996. This poem captures the essence of Bob's quest for DXCC/QRP. True to the poem, Bob worked country #125 on 40M CW Jan. 21, 1996.]

The QRP Lament

I'm a little peanut whistle,
And my antennas not so hot.
I can't compete with power
But I try an awful lot.

QRP, QRP. Won't you
Listen, please, for me?

The big guys work the DX
And leave the crumbs for me.
But I'm always in there calling,
Working for DXCC

QRP, QRP. Won't you
Listen. please. for me?

It only takes a minute
To listen to my plea,
And I'll be forever grateful
If you'll stand by just for me.

QRP, QRP, Won't you
Listen, please, for me?

I'm getting old and weary,
and the prop is mighty low.
I'd like to make my hundred,
Before I have to go.

QRP, QRP. Won't you
Listen. please, for me?

But somewhere up in heaven
There's a place, I know for me
Where the DX always says,
"Lets hear the QRP!"

QRP, QRP. Thanks for
Listening just for me!
Arvid E. Hamer. WA6UUT

QRP To The Field, #2

by Bob Farnworth, WU7F
6822 131 AVE SE
Bellevue, WA 98006
USA

SECOND ANNUAL - "QRP TO THE FIELD"
SATURDAY, APRIL 27, 1996

GET READY FOR JUNE FIELD DAY, BY TESTING EQUIPMENT ON THE "QRP TO THE FIELD" - OPEN TO ALL RADIO AMATEURS, AND ALL BANDS AND BOTH MODES (SSB/FM AND CW). SPONSORED BY THE "NORTHERN CALIFORNIA QRP CLUB". SINGLE TRANSMITTER ON THE AIR AT ONE TIME. ONCE STARTED, USE THE SAME POWER OUTPUT AND LOCATION CATEGORIES. CONTEST PERIOD: SATURDAY 1300 UTC TO SUNDAY 0100 UTC - MARK YOUR LOGS TO INDICATE YOUR BEST (8) CONTINUOUS HOURS FOR SCORING.

EXCHANGE: SIGNAL REPORT AND STATE, PROVINCE OR COUNTRY
QSO POINTS: 1 WATT OR LESS OUT - 10 POINTS (EITHER MODE)
5 WATT OR LESS OUT - 5 POINTS
OVER 5 WATTS - 2 POINTS
MULTIPLIERS: FIELD LOCATION 4 x MULTIPLIER
FIELD LOCATION = BATTERY POWER & TEMPORARY ANTENNAS
HOME LOCATION 2 x MULTIPLIER
HOME LOCATION = COMMERCIAL POWER & PERMANENT ANT.S
HOME BREW EQUIPMENT 3 x MULTIPLIER.
HOME BREW = IF YOU BUILT IT, IT IS CONSIDERED HB
COMMERCIAL EQUIPMENT 2 x MULTIPLIER

FINAL SCORE = BAND/MODE QSO POINTS x LOCATION MULT. x EQUIP. MULT. = BAND/MODE TOTAL. ADD THE BAND/MODE TOTALS FOR THE FINAL SCORE

EXAMPLE:
(20) 20M/SSB QSO'Sx5(5W)x4(FIELD)x2(COMM)= 800 POINTS
(35) 40M/CW QSO'Sx5(5W)x4(FIELD)x3(HB)= 2100 POINTS
FINAL SCORE = 2900 POINTS

AWARDS: TOP TEN SCORES CERTIFICATE (THE TEN STATIONS WITH THE HIGHEST SCORES) PARTICIPANT CERTIFICATE FOR 20 OR MORE CONTACTS (INCLUDE A 9x12 MANILA ENVELOPE WITH 3 UNITS OF POSTAGE) SEND LOGS ALONG WITH A STATION AND LOCATION DESCRIPTION TO:

BOB FARNWORTH, WU7F
6822 131 AVE SE
BELLEVUE, WA
98006-4038 USA

GET IT IN BY MAY 31, 96. ALL CONTEST COMMITTEE DECISIONS ARE FINAL. INCLUDE A #10 SASE IF YOU WANT A COPY OF THE RESULTS. QRPp WILL PRINT RESULTS.

The Epiphyte-2: 75M Portable SSB Transceiver

by Derry Spittle, VE7QK
1241 Mt. Crown Rd.
North Vancouver, BC
V7R 1R9 Canada
jds@freenet.vancouver.bc.ca

[Since my construction article for the EP-2 was published in the December, 1995 issue of SPRAT, I have modified the PA/ Driver section. While this may be made to the original PCB, I have taken the opportunity to revise the text to reflect the changes and redraw the board. Much remains unchanged and is reprinted with kind permission of the G-QRP Club. Wherever parts have been eliminated the numbering of the remainder has not been altered. Derry, VE7QK]

Construction articles for the original Epiphyte were published in Sept.,1994 QRPp and further articles for a 5W amplifier and VFO appeared in the Dec. 1994 issue of QRPp. The EP-2 includes both these features without increasing the size and without compromising the original objectives of simplicity and minimum power consumption.

The Driver Stage is a CA3020A differential amplifier (U5) and replaces the original pair of VN10s to make room for a power amplifier. Operating from a 9V supply, this stage has a power gain of 60dB, an idling dissipation of 200mW and an output of 500mW. It is matched to a 22 ohm resistive load (R23) at the gate of the final amplifier with a broad band transformer (T1).

The Power Amplifier (Q4) is an IRF510 Mosfet with an RF output of 5W PEP. Some instability became noticeable when using the original Tee-match and it has been replaced with a more conventional broadband transformer. Shunt feedback has also been added. The low-pass filter is inserted in the antenna feeder if there is insufficient space within the enclosure.

The VFO is a varactor tuned Vackar circuit and replaces the 4.19MHz ceramic resonator (VXO). The inductor is a Toko 3.3uH variable coil.

The RF BandPass Filter uses the same Toko 4.7uH coils but has been remodelled in a series-tuned configuration using W7ZOI's GPLA program. It has a reasonably flat response over some 200kHz and sharper roll-off on the high frequency side to improve rejection of the image frequency. It has an input impedance of 1500 ohms to match the NE602 mixer and terminates in a 100 ohm resistive load to ensure stability in the driver. Fixed capacitors are "standard" values.

The microphone input is a 2-pin Molex connector (Con 6). R19 provides the polarizing voltage for an electret microphone (2-terminal type) and should be omitted if a dynamic microphone is used. The value of R20 should match the impedance of the microphone. The speech amplifier (U6) gain may be adjusted by changing the value of R17.

Construction:

Assembly is fairly straightforward, but here are a few suggestions. Some fairly large value polystyrene capacitors are specified. Their physical size should be ascertained before ordering if they are to fit comfortably on the board. Ensure that the Toko coils (L3, 5, 6, & 8), filter (F1), ceramic resonator (X1) and trimmer cap (C10) fit the PCB; enlarge the holes if necessary. Install the CA3020A (U5) first; it is easier to align the twelve pins without other components in place. Be sure to solder in the two jumper wires before installing the socket for U1. Remove the center pin before mounting the IRF510 (Q4) and heat sink with a 4-40 machine screw, nut and star washers. Remove unused terminals from the relay socket. Finally, don't bother soldering the three unconnected pins on the Toko coils to the ground plane; you may need to remove the coils one day!

Alignment and Testing:

This must be carried out with the single sided PCB fastened to a ground plane with four metal stand-offs.

1. Remove both metering jumpers. Install the Relay (K1) and PTT switch if not built into the microphone. With all IC's removed connect to a 12-14V **Fused** supply. Verify that VR2 is delivering 5V and that VR1 is delivering 9V on transmit. With an RF probe check that both oscillators are functioning. Set the LFO to 453kHz with the trimmer (C10). Change the padder (C11) if necessary.

2. Adjust L3 and R24 to set the tuning range. Bandspread, with the 10 turn pot (R25), should not exceed 20kHz /turn or tuning will be too critical. Shorten the slug in L3 so that it sits flush with the top of the can and fix with beeswax or sliver from a rubber band.

3. Install all IC's. Connect the antenna, speaker, volume control. Test the receiver and adjust L8.

4. The RF voltage at pin 6 on each of the two mixers should read 140mV +/- 25%. If necessary, change the value of C5 and/or C6.

5. Set the RF drive control (R15) to minimum. Measure the transmit standing current in the driver (U5) at Con7. If this is not 25mA +/- 10%, transformer (T1) or the driver (U5) has probably been incorrectly installed.

6. Adjust R3 to set the transmit idling current in the power amplifier (Q4) to 10mA at Con8. **ONLY AT THIS POINT MAY BOTH METERING JUMPERS BE INSTALLED.**

7. Advance the RF drive (R15) until RF voltage appears across a 50 ohm dummy load while modulating with a tone (whistle!). Adjust the bandpass filter (L5 & L6) to maximize. Continue increasing the drive until it peaks to around 16 volts. The driver current should rise to 60 or 70mA and drop to around 25mA with no modulation. The IRF510 current should rise to 500mA and drop to around 10mA with no modulation. Monitor the signal on a receiver and/or oscilloscope. The "average" current with normal speech modulation will, of course, be considerably less. This completes the alignment.

8. While it isstronly recommendedthat a simple testchassis be used during construction and alignment there is a great deal of flexibility permitted in the final packaging. External connections should be keptas short as possible. The size of the PCB (2.9" x 4.75") was chosen with the TenTec Model TP-20 enclosure (5" x 4" x 2") in mind.

A small simple Digital Display with a frequency resolution of 100Hz has been designed for use wtih the EP-2 and to mount in the upper half of the Ten-Tec enclosure with the display behind the front panel. This will be the subject of an article in the next issue of QRPp.

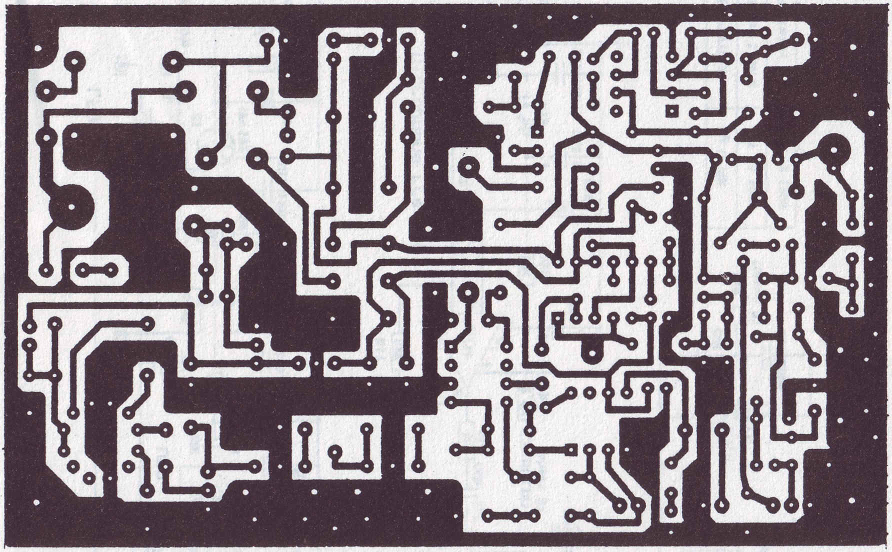
Have fun and feedback is welcome and encouraged. 72, Derry, VE7QK

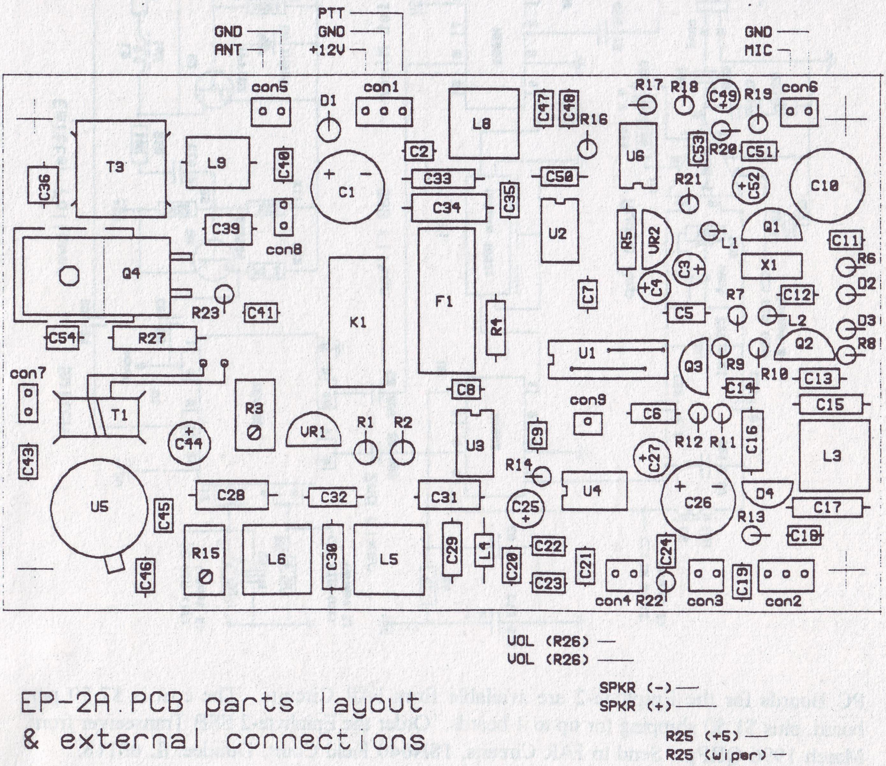
Epiphyte-2 Parts List

C1	100uF elect.
C2	0.1uF mon. cer.
C3	1uF tant.
C4	1uF tant.
C5	24pF NPO
C6	24pF NPO
C7	330pF disc. cer..
C8	0.1uF mon. cer.
C9	330pF disc. cer.
C10	100pF trimmer
C11	50pF NPO
C12	1200pF cer.
C13	100pF NPO
C14	24pF NPO
C15	2200pF axial poly
C16	820pF axial poly
C17	1000pF axial poly
C18	0.1uF mon. cer.
C19	0.1uF mon. cer.
C20	0.1uF mon. cer.
C21	0.1uF mon. cer.
C22	0.1uF mon. cer.
C23	0.1uF mon. cer.
C24	0.1uF mon. cer.
C25	4.7uF elect.
C26	100uF elect.
C27	10uF tant.

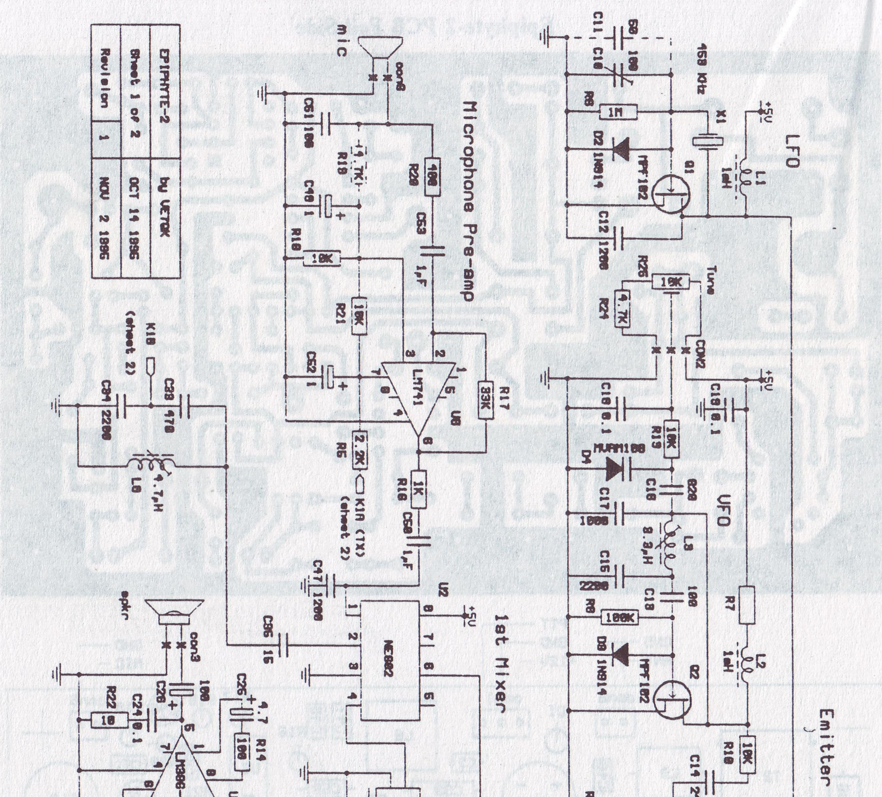
C28 2200pF axial poly.
C29 470pF axial poly.
C30 5600pF axial poly.
C31 2200pF axial poly.
C32 470pF axial poly.
C33 470pF axial poly.
C34 2200pF axial poly.
C35 15pF NPO
C39 0.1uF mon. cer.
C40 0.1uF mon. cer.
C41 0.1uF mon. cer.
C42 0.1uF mon. cer.
C43 0.1uF mon. cer.
C44 1uF tant.
C45 0.01uF mon. cer.
C46 0.01uF mon. cer.
C47 1200pF disc. cer.
C48 0.1uF mon. cer.
C49 1uF tant.
C50 1uF Non Polarized
C51 150pF disc. cer.
C52 1uF tant.
C53 1uF Non Polarized
C54 0.1uF mon. cer.
R1 4.7K
R2 4.7K
R3 10K (10 turn trim pot)
R4 47 ohm
R5 2.2K
R6 1M
R7 100 ohm
R8 100K
R9 22K
R10 10K
R11 22K
R12 2.2K
R13 10K
R14 100 ohm
R15 100 (10 turn trim pot)
R16 1K
R17 33K
R18 10K
R19 4.7K
R20 400
R21 10K
R22 10
R23 22
R24 4.7K
R25 10K, Ten Turn Pot
R26 20K Pot
R27 270 ohm
VR1 78L09
VR2 78L05
U1 MC14066
U2 NE602A
U3 NE602A
U4 LM386-4
U5 CA3020A
U6 MC1741
Q1 MPF102
Q2 MPF102
Q3 2N3904
Q4 IRF510
L1 1mH choke
L2 1mH choke
L3 3.3uH var. coil (Toko BTKANS9445)
L4 1mH choke
L5 4.7uH var. coil (Toko 154AN-T1005)
L6 4.7uH var. coil (Toko 154AN-T1005)
L8 4.7uH var. coil (Toko 154AN-T1005)
L9 RFC (7 sec. T on Amidon FB43-801)
T1 5 bifilar t. on Amidon FB-43-2401 with 2T. output overwound.
T2 2 turns on Amidon FB-43-2401
T3 broadband transformer. 2 t. primary, 5 turn sec. on Amidon BN-43-202
F1 455kHz SSB filter (MuRata 455J1)
K1 Miniature 12V DPDT relay.
X1 455kHz ceramic resonator
2 3 pin Polarized Molex connectors (0.1" spacing)
4 2 pin Polarized Molex connectors (0.1" spacing)
2 2 pin headers (0.1") spacing
2 2 pin jumpers
1 1 pin header (test point)
D1 "Idiot Diode" optional
D2 1N914
D3 1N914
D4 MVAM108 tuning diode
Heat sink (Q4)
4 x 4-40 1/4 inch metal standoffs
1 LED
4 8 pin IC sockets
1 14 pin IC socket
1 16 pin IC socket
1 Epiphyte 2 PC board

Epiphyte-2 PCB Foil Side

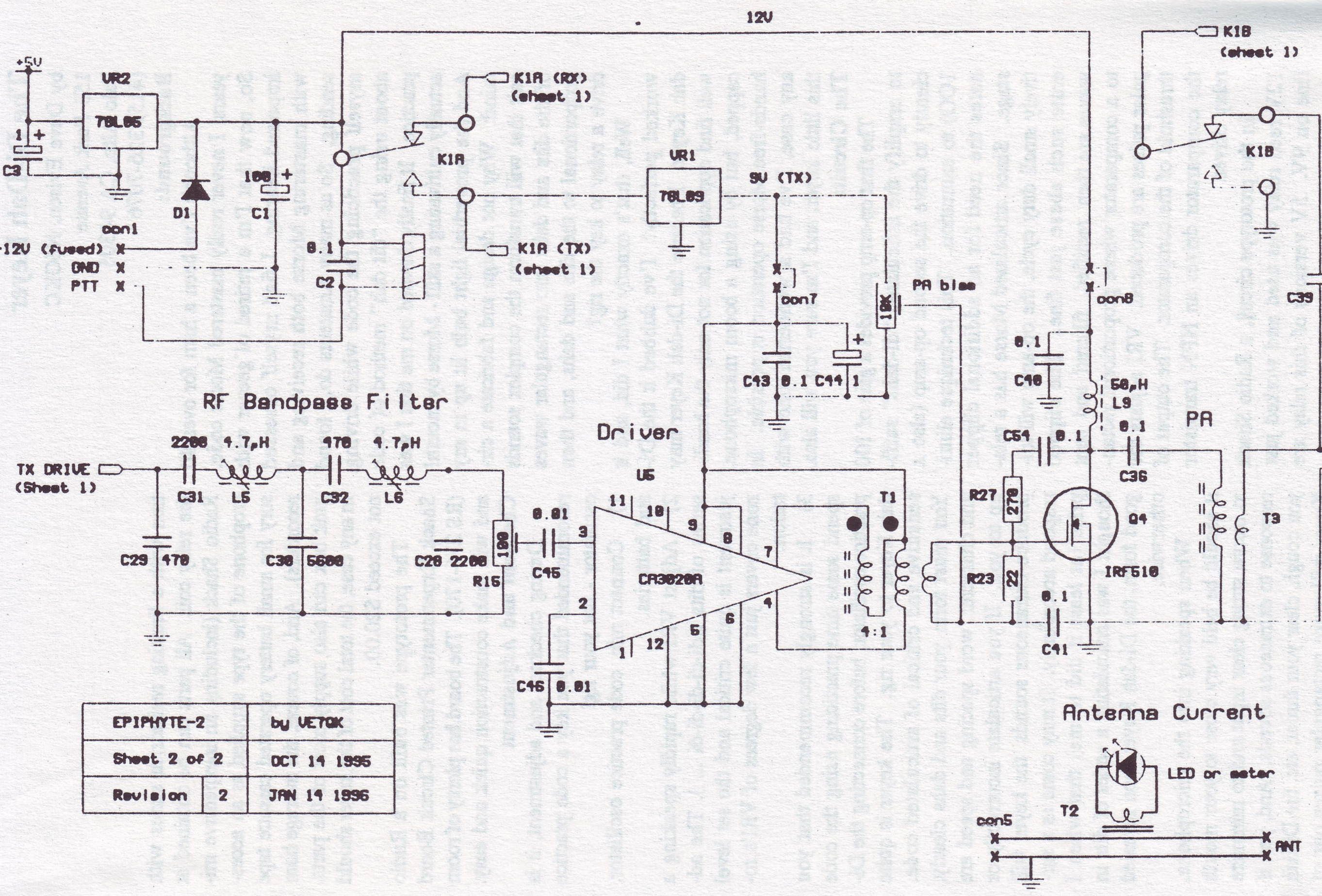




EP-2A PCB parts layout
& external connections



PC Boards for the Epiphyte-2 are available from FAR Circuits. The cost is $7.50 per board, plus $1.50 shipping for up to 4 boards. Order the Epiphyte-2 SSB Transceiver from March 1996 QRPp. Send to FAR Circuits, 18N640 Field Court, Dundee, IL 60118.


12V
+5V
VR2
78L05
1 +
C3
D1
100 +
C1
0.1
C2
con1
+12V (fused) X
GND X
PTT X
K1A (RX)
(sheet 1)
K1A
K1A (TX)
(sheet 1)
VR1
78L09
9V (TX)
con7
C43 0.1
C44 1
10K
PA bias
K1B
(sheet 1)
K1B
con8
C39 0.1
0.1
C40
50µH
L9
RF Bandpass Filter
TX DRIVE
(Sheet 1)
2200
C31
4.7µH
L5
470
C32
4.7µH
L6
C29 470
C30 5600
C28 2200
100
R15
0.01
C45
C46 0.01
Driver
U5
CA3028A
T1
4:1
C54 0.1
0.1
C36
PA
con5
R27 270
R23 22
Q4
IRF510
0.1
C41
T3
EPIPHYTE-2
by VE7QK
Sheet 2 of 2
OCT 14 1995
Revision
2
JAN 14 1996
Antenna Current
LED or meter
T2
con5
ANT

The Di-Dah Keyer

by Dave Evison, N6GKC
153 Park Avenue
Palo Alto, CA 94306
(415) 326-7076

Background:

Although I've been a ham for over 40 years, I never really mastered Morse code. So, now that I'm a retired ol'geezer with impaired hearing, I find myself obsessed with mastering Morse both receiving and sending. So as many Amateurs do, I found myself practicing the code while driving about using the "dit dah" method of code practice. It finally dawned on me that I was actually cultivating a skill - Morse by mouth! And the proverbial light bulb lit up in my mind: Why not design and fabricate a circuit that will transform the complex sounds of the dits and dahs into rectangular waves proportional to the dits and dahs, and then drive a relay to key the rig?

Well, that's exactly what I did, and it worked perfectly! I've dubbed it the Di-dah Keyer. I believe the Di-dah Keyer may well find application for not only the handicapped, but by using a boom microphone, hands-free Morse operation is possible. In any case, I've had a wonderful time with this little keyer, and I'm sure you will also.

The Circuit:

The first op-amp provides a gain of 100 to amplify the articulated "di-dahs" sufficiently to drive the second op-amp (also x 1OO) to saturation. This technique eliminates the need for an additional clipper stage. Since articulated Morse has a relatively small duty cycle, the op-amp will tolerate such abuse just fine. The clipped waves are then rectified, filtered and sent to a comparator where proportional rectangular pulses are produced. VRI adjusts the threshold of the comparator. The output of the comparator drives an NPN transistor relay driver.

In the prototype circu¶, a Radio Shack 12V reed relay was used and worked just fine on 9V. 5V versions of this relay are also available and may be used in conjunction with a limiting resistor in series with the relay coil. All parts can be obtained at Radio Shack (including an inexpensive microphone of the type supplied as an accessory for small battery operated cassette tape recorders). And, of course, the average ham junk box can also supply most of the parts. In any case, the total cost of the keyer should not exceed $20.00.

The prototype was built on a Radio Shack Experimenter Printed Circuit Board (RS 276-170). The board has plenty of room and will make construction quick and easy.

Checkout and Adjustment

During checkout and adjustment, it is recommended that you key a code practice oscillator - not your rig!

1) Connect mic, code practice oscillator, and batteries.

2) Adjust VRI while rapidly speaking a series of dits (,di-di-di-di-di ...). The adjustment is quite critical and the set level zone covers just a few degrees of VRl's rotation.

3) It is strongly recommended that you spend some time practicing using the code practice oscillator, before connecting the Di-dah Keyer to your rig. The keyer is quite sensitive and critical of articulated code. You must form your dits and dahs clearly, and character, word spacing and speed are up to you. If you articulate incorrectly or produce extraneous sounds, the keyer will respond acconJingly. It may come as a surprise (at least it did to me) that when I thought I was articulating a series of dits in good form, the Di-dah Keyer soon revealed otherwise.

When speaking into the microphone, it should be held very close to your mouth to insure strong clear input and to minimize response to extraneous sounds. And, yes, if you cough, clear your throat, etc. the Di-dah Keyer will make rectangular pulses out of

that also.

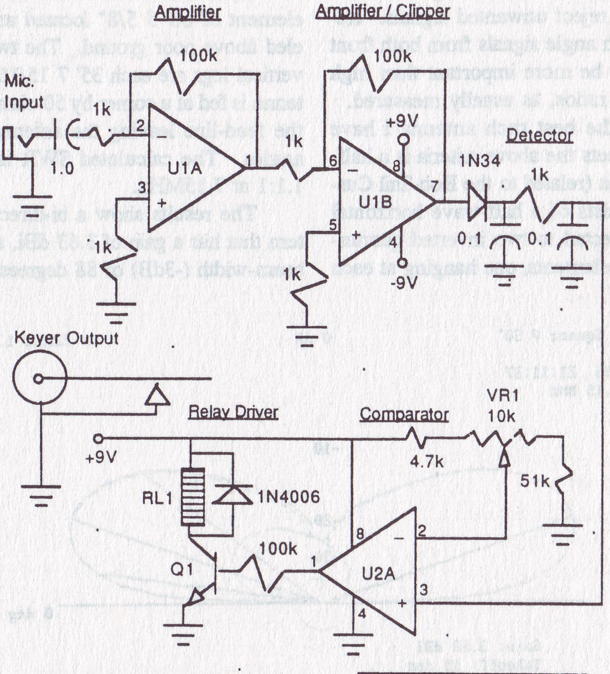
An off-the-wall closing thought... The Di-dah Keyer also provides the Novice and Coded Technician with a way to legally use "voice" on HF.
73'S, Dave E

Parts List

UI, U2 1458 Op-Amp(Radio Shack (276-038)
QI Generic NPN switch
All resistors are 1/4 watt 5% or better
RLI Reed Relay (RS 275-233 or 275-232)

Note: The keying relay is a Radio Shack 12V reed relay. In the prototypes It worked fine on 9V. A side benefit of the reduced solenoid voltage appears to be better action (less contact bounce and faster release time). However,'if the 12V version does not work effectively in your circuit, a 5V version is available from RS and may be used with suitable current limiting resistor in series with solenoid coil.

Di-Dah Keyer
by N6GKC



U1, U2 1458 Op-Amp (Radio Shack 276-038)
Q1 Generic NPN switch
RL1 Reed Relay (RS 275-233 or 275-232) See Note
All resistors are 1/4 watt 5% or better

Di-dah Keyer
N6GKC

Note: The keying relay is a Radio Shack 12V reed relay. In the prototypes It worked fine on 9V. A side benefit of the reduced solenoid voltage appears to be better action (less contact bounce and faster release time). However, if the 12V version does not work effectively in your circuit, a 5V version is available from RS and may be used with suitable current limiting resistor in series with solenoid coil.

A Simple Portable Antenna for DX

by Frank McCrackin, WB6LMA
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Grants Pass, OR 97526

I have become very interested in QRP operation on the HF bands with an emphasis on portability and simplicity. Using ELNEC and more recently, EZNEC, I have been exploring quite a few different antennas to find options that have the potential for good DX capabilities. By the latter, I mean low angles of radiation for transmission and rejection of incoming signals at moderate and high angles relative to the horizon. I consider the latter equally important; to me, gain is no more important than the ability to reject unwanted signals. Rejection of high angle signals from both front and back can be more important than high front to back ratios, as usually measured.

So far, the best such antenna I have found that meets the above criteria is a half-square antenna (related to the Bob-Tail Curtain). It consists of a half-wave horizontal element connected to two inverted quarter-wave vertical elements, one hanging at each end. Another way to view it is as two elevated, inverted quarter-wave verticals, with a proper feed system, and comprising a simple two element bi-directional beam.

Using EZNEC, I have modeled half-square antennas for all HF bands from 40 through 10 meters. For this discussion, I have chosen a 40M antenna for the reason that the lower the frequency, the more difficult it is to achieve low angle radiation with relatively low antenna heights.

This 40M antenna has its horizontal element of 68' 5 5/8" located at 50', modeled above poor ground. The two hanging vertical legs are each 35' 7 15/16". the antenna is fed at a corner by 50 ohm coax with the feed-line leaving the antenna at right angles. The calculated SWR is less than 1.1:1 at 7.15MHz.

The results show a bi-directional pattern that has a gain of 3.63 dBi, an azimuth beam-width (-3dB) of 88 degrees, a vertical

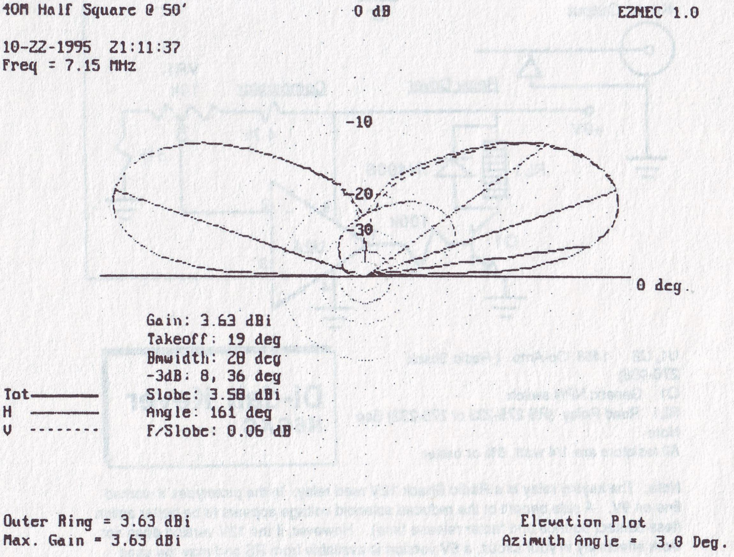


Figure 1

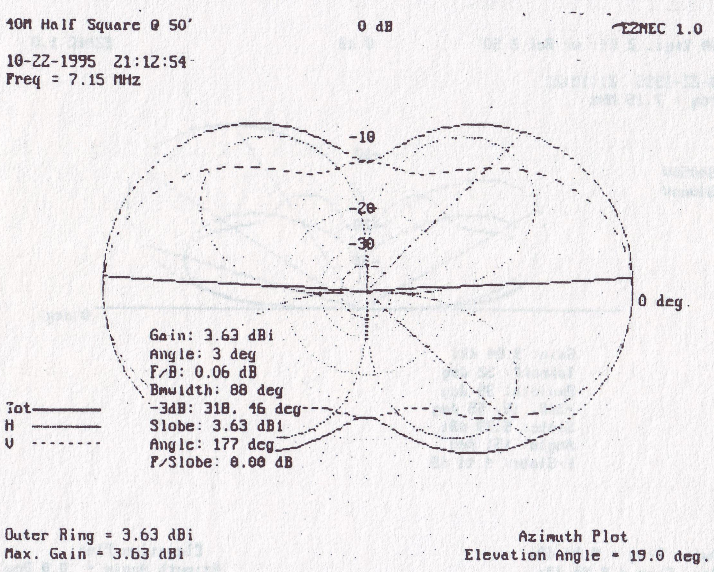


Figure 2

takeoff angle of 19 degrees above the horizon, with -3 dB angles of 8 and 36 degrees above the horizon. The polarization is dominantly vertical as the horizontal element shows little radiation. Both elevation and azimuth plots with horizontal and vertical patterns are shown as figures 1 and 2 respectively.

For comparison, I also modeled a wire Yagi with the second element as a reflector (a director gave a quite different and poorer vertical pattern). Although this two element Yagi is quite a bit more complex and more difficult to erect than the half-square, my model resulted in an antenna also resonant at 7.15 MHz. but with a 27 + j .06 ohm impedance (1.819 SWR at 50 ohms and 1.091 at 30 ohms). Maximum gain was 9.84 dBi at 32 degrees takeoff. The -3 dB angles were 16 and 55 degrees. At 8 degrees above the horizon, the Yagi and the half-square were matched in terms of dBi. This point was -3 dB for the half-square but -9 dB for the Yagi.

As compared to the half-square, the Yagi favors received signals in the elevation range of 15 to 60 degrees by from 4 to 14 dB, resulting in lots of high angle QRM to interfere withreally low angle, long distance signals. I have included elevation and azimuth plots of the Yagi with plots for the half-square superimposed. On these plots, I have also added plots of a 40M half square with the horizontal wire at 66'. IT is interesting to note that this increase to a full 1/2 wave of elevation makes very little improvement. Raising the antenna still further lowers the takeoff angle only slightly but causes a secondary lobe to begin to show increased reception of high angle signals. See figures 3 and 4.

This 40M half-square at 50' is also resonant at 21.225MHz It's impedance is 181.2 -j .463 ohms and the SWR (50) is 3.624. With an antenna tuner, the antenna should be usable on 15M. Gain at 14 degrees is 6.11 dBi and the -3 dB angles are 7 and 24 degrees. There are four major lobes, two slightly larger than the others, tending to favor azimuth angles of 35 to 40 degrees from the plane of the antenna (see figures 5 & 6).

Using a tuner and open-wire feed, the

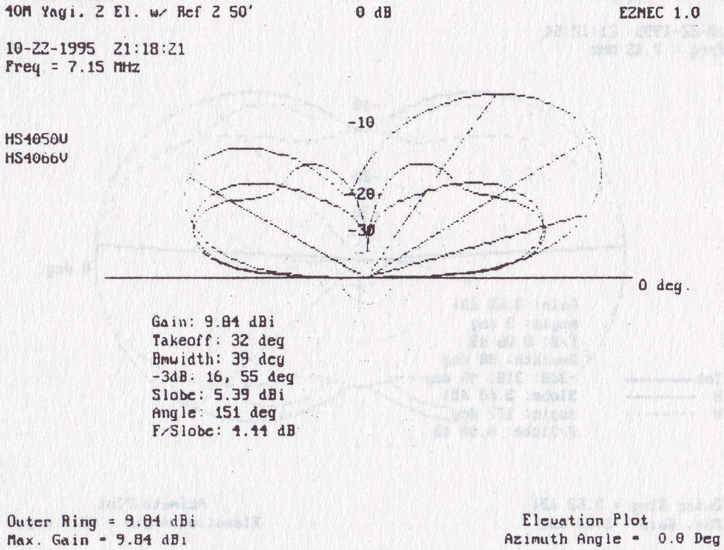


Figure 3

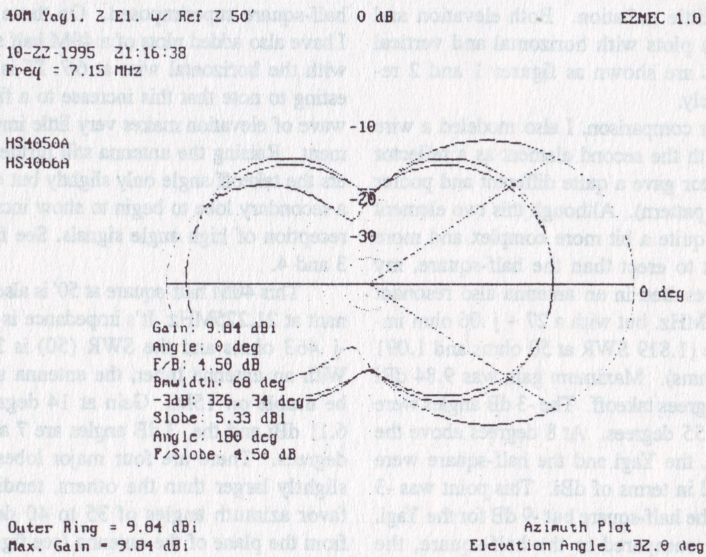


Figure 4

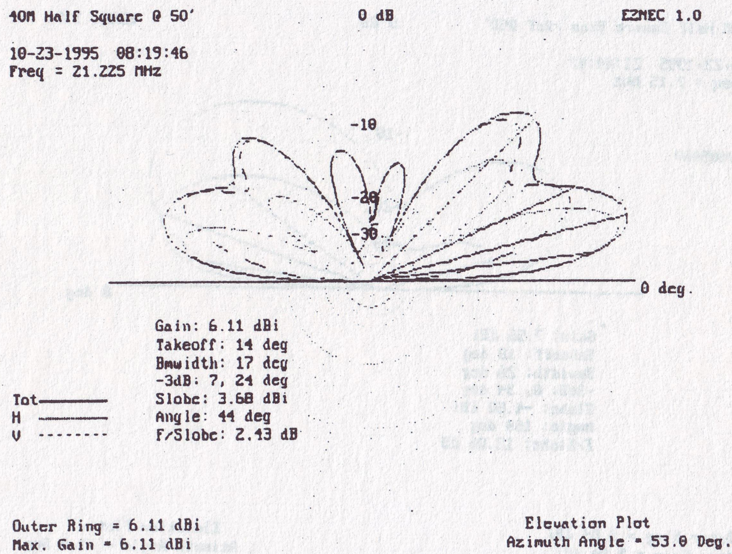


Figure 5

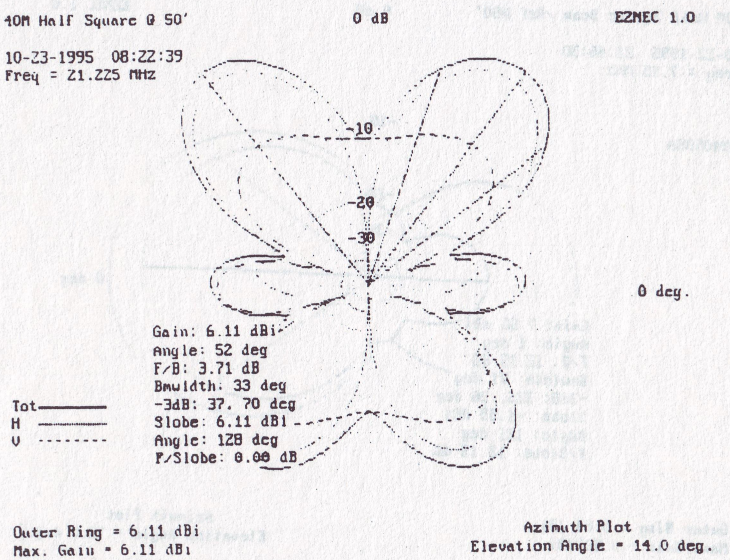


Figure 6

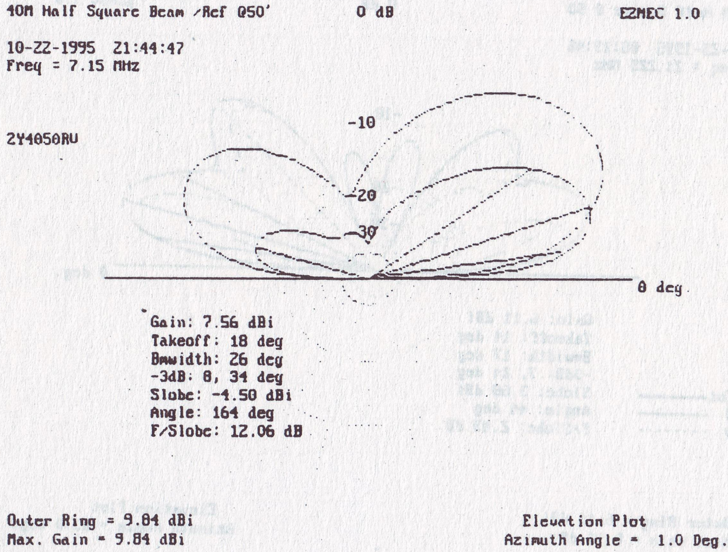


Figure 7

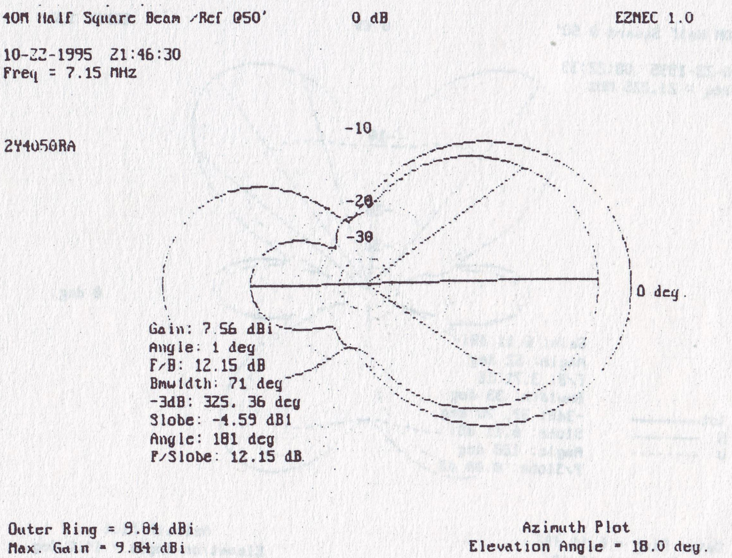


Figure 8

antenna should be usable on all of the HF bands above 40M. Maximum radiation angles decrease in elevation as the frequency goes up, ranging from 20 degrees on 30M to 10 degrees on 10M. Gain improves also, 4 dBi on 30M, rising to 6.82 dBi on 17M and then gradually dropping to 5 dBi on 10M. Multiple lobes on both azimuth and elevation patterns show up beginning with 20M and increasing as the frequency moves to 10M.

If still more gain and directionality is needed, one can make a 2 element half-square beam with the elements spaced about 1/8 wave-length. I modeled one at 50' with only the vertical components of the reflector increased by about 5%. this model showed a gain of 9.84 dBi, with a take off angle of 18 degrees and -3 dB angles of 8 and 34 degrees. The front to back ratio was about 12 dB vs. about 5 dB for the Yagi. I have included a print-out of elevation and azimuth plots for this antenna compared to the Yagi also, see figures 7 & 8. the lower angle of radiation is quite marked.

If one wants a lot of moderate to high angle reception with a simple and easily erected antenna, use a dipole or an inverted vee at a reasonable height. If you really want very low angles, simplicity of design and erection, and a minimum of high angle QRM, use a half-square at an elevation of not more than 1/2 wave length.

I have no vested interest in the half-square concept. If I were operating portable in the field, a dipole (or inverted vee) plus a half-square (or two at right angles) should provide first class flexibility. Working from a fixed station, a dipole and two half-squares at right angles should give the usual 3 element Yagi tribander a fit if they are all mounted at the same height. As I see it, the principle advantage such a Yagi would have would be improved QRM rejection at medium to high incoming angles because of its superior front-to-back ratio at such angles. Cost-wise, the Yagi can't compete. I would welcome any better designs that embrace my criteria. I am still chasing the fantasy(?) that there must be something that is even better.
72, Frank

Reveiw of the Small Wonder Labs Green Mountain-30 CW Transceiver

by Chuck Adams, K5FO
Box 181150
Dallas, TX 75218-8150
adams@sgi.com

MFR: Small Wonder (tm) Labs
Address of MFR: Dave Benson, NN1G
80 East Robbins Ave.
Newington CT 06111
Designer: Dave Benson, NN1G
Model: Green Mountain 30 (GM-30)
Size: 3.5" x 5.0" board
Weight: 3.25 ounces for board and onboard parts
PC board: Double sided, plated-through, solder masked (green), and silk-screened. A beautiful board.
Manual: 18 pages 8.5"x11" double sided
Power : 12 to 15VDC
RX Drain: 37.0mA at 12.7V
TX Drain: about 300mA with 1W out
Modes: CW only
Kit?: Yes. PC board and on board parts.
Bands: 40M, 30M, 17M, 20M and 15M at the present time
LO/VFO: Heterodyne Osc with 18.100-18.165MHz out for 30M.
Drift: 5 Hz first minute, 62Hz after 30 minutes. This is the best frequency stability measured on any of my rigs.
Dial Range: Builder supplies markings
RX: SuperHet
XMT: Yes. 0.050-3.0W output internally adjustable
Filter: Four crystal filter at 8.000MHz
Selectvty: about 700Hz
RIT: Yes
Gain: Audio.

AGC: No
Preamp: No
Atten: No
SPKR: No. Did use with Radio Shack XTS 3 Cube Speaker. Good audio out with the above.
Meter: No
S Tone: No.Signal monitoring
VFO: Yes. Covers 65KHz of 30M band.
Output: 0.05-3.0W adjustable internally Measured 2.1W out max with 12.74V
Internal Keyer: No
QSK: Yes
Price: $72.00 US postage included.
Availability: From NN1G direct to callbook address. See above.
Options: Case and pots. Price not known at time of this writing.
Date of Review: January 25, 1996
Author: Chuck Adams, K5FO
Comments: Another fine rig from NN1G. This puppy will be with me on my travels for the next year. I don't know about you, but after I read about a new rig in one of the newsletters and I decide that it is something that I'd enjoy building and operating and after dropping the money order into the mailbox I'm like a little kid. I clear off the desk and get organized and I get ready for the big day - the day that the package arrives. The first publication to have the Green Mountain rig from Dave Benson, NN1G, was the "72" News letter fromthe NE Club famous for QRP Afield and the NE40 kit. It took the US Postal Service about 7 days to get the plain brown padded envelope from Dave Benson's place to my PO Box using first class mail.

The board and parts are bubble wrapped on top of that and everything arrived in nice shape.The manual is well written and the board is very nice. Dave has done another wonderful job is getting the kit together.

The instructions have you build the Hetrodyne Osc first. Then if you have followed his instructions and you have done everything you power it up and test it. Mine came up the first time and was easily adjusted for maximum output. The frequency was right on and required no additional mods. After getting everything else soldered in and double checking for missed solder points, shorts, etc. and then using the toothbrush(not the one I brush with) with water to remove the solder flux from the 63/37 solder, I install the board into bottom half of the shell case that I typically use as I have a garage full of them. Oh, I use the Kester SN63PB37 with 331 Organic Core.

The kit does not have the case, connectors, and required three pots of 5K, 10K, and 100K (linear) which I got at Radio Shack. I hooked up everything to a 4AHr Gel-Cell and adjusted the receiver. This receiver has much greater sensitivity than the SWL-30 (to be expected due to additional gain with IF amp in the GM-30). First station heard was a KK6 in Santa Cruz CA, then a W2 in Beesleys Point NJ, and the third station heard was ZK1DI.

I also discovered that I now have to turn off the computer on the desk top due to hash RFI from it. Didn't notice this before. So I know that the receiver is extra sensitive. Turned system off for an hour then came back with frequency counter for drift measurements. First minute gave 5 Hz drift and after 30 minutes drift had settled to 62Hz. So it is super stable. Oh, calibrated counter with 3.600000MHz out of GC-1000 Heath clock both before and after to make sure that the counter didn't drift. Sure enough it didn't.

Checked out the transmitter and it's adjustable from 0.05 to about 2W out. When checking the keying I got the scare of my life when I heard a chirp. Turns out the gel-cell was low and I switched to a 20AHr to stabalize the voltage to 12.75V and all was fine. After charging the gel-cell found that it was good too. Got the OHR WM-1 and set the GM-30 for 0.95W output. Since Saturday have worked about 20 stations (not enough time on the air yet) and all have given super reports. Worked a KG4 on 30M this a.m. at 6:15CST (1215Z), so 30M has been open. In fact I've been hearing stuff on at midnight local. I do have a small click in phones on individual elements of keying.

so think that the keying circuit will require an additional cap to soften the make/break. More to follow as time permits.

Doug Hendricks in a phone conversation the other day mentioned the R/S speaker, so I stopped by and picked one up. Rather pricey at $16, but it is nice. The GM-30 had the audio power to drive it to comfortable levels in a 15x18' room and with headphones I do not ever have to run the gain over about a 1/4 to1/3. On the SWL-30 I often had to run at 80% or better. So the new audio circuit that Dave has is super. The additional stage with the IF amplifier makes all the difference in the world on total gain. The speaker used was the XTS 3 Cube Speaker System from your friendly Radio Shack Dealer.

From my previous postings by members of the qrp-l group on the SWL-XX burping when powered off. I figured the audio section was going into oscillation when powered off. I was right. You can get the SWL-30 to go into oscillation when powered on by having a strong signal come on while you have the volume up. I discovered this the hard way when monitoring the keying of the GM-30 next to the SWL-30. Don't do this at home kids...... Also found when I had gone to a NorCal meeting and purchased a gel-cell at Livermore that was at 10.7V the NE40, a.k.a. SWL-40, oscillates like crazy in the audio preamp section due to low voltage and this is what we are hearing when power is removed and the little rig "burps".

I think we are going to see $75 as the price point, what with Roy's NW80/30 series and others, for single band high performance kits without a case. With case and all it looks like $100 is the price. I got the Oak Hills Research Explorer II also for 30M and a comparison of the receivers shows that they are almost identical in sensitivity to my ears on the antenna. There is no comparison on sensitivity with the NorCal 30A since the NC30A does not havean IF section. Same is true of the SWL-30 rig. So Chuck says check it out if you are looking for a small singleboard rig that has a lot of band for the buck [sic]. If you see me at the NorCal meeting I'll have the 30M rig with me. And I'll be at the NorCal meetings about three or four times this year. I save the company about $600 on airfare by coming to CA on Saturday. Killing two birds with one stone, so to speak.

If you are a first time builder or want a step-by-step set ofinstructions, either send me a SASE business envelope or email at the email address at the top of the article and I will see that you get a set. It helped me speed things up.dit dit es see you on the air—Chuck Adams (K5FO CP-60) adams@sgi.comBox 181150, Dallas, TX 75218-8150

Build A QRP Antenna Tuner with Home Brew Roller Inductor

by Floyd E. Carter, K6BSU
2029 Crist Drive
Los Altos, CA 94024

This small QRP antenna tuner is intended for portable or FD operation on 40 meters and higher frequency bands.

What is not expected is that this versatile antenna tuner features a roller inductor! The tuning resolution is infinite within its range, making it possible to match virtually any coax fed resonant antenna for maximum power from your transmitter. It is no longer necessary to compromise for "almost OK" simply because the fixed taps on your commercial QRP tuner are seldom in the correct place for <u>your</u> antenna and <u>your</u> operating frequency.

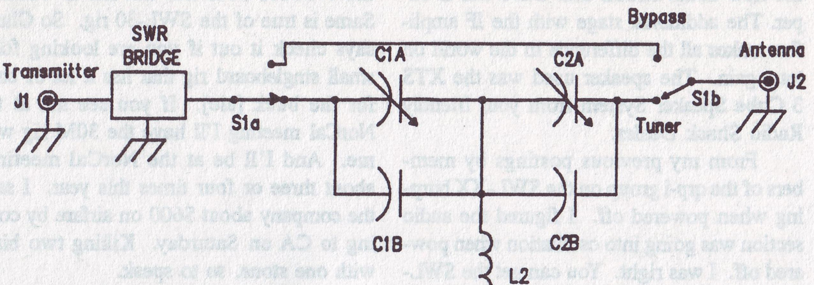
The purpose of an antenna tuner connected between a transmitter and a transmission line/antenna is sometimes misunderstood. A tuner will not improve the performance of a resonant antenna operating away from its resonant frequency. a tuner will tune out the reactance of an antenna when it is off frequency, so that the trans-

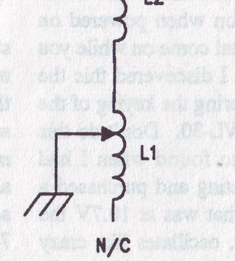
mitter can operate into a purely resistive load, and so deliver maximum power.

For tuning flexibility, I chose the popular high pass T network. This circuit matches a wide range of complex antenna impedances while using L and C components of reasonable values. The schematic diagram for this antenna tuner is shown in Figure 1.

For the inductor winding, drill and tap two 4-40 screws into the acrylic rod 3 1/2" apart. You will need 5 feet of 18 gauge tinned copper bus wire. Solder one end of the wire to one of the screw heads. Clamp the free end of the wire in a vise and slowly and carefully wind the wire onto the acrylic rod, while keeping constant tension on the wire. Try to maintain about 0.2" between

K6BSU ANTENNA TUNER





Parts List

J1, J2	BNC Jack
S1	DPDT Switch
C1A,C2A	100pF Air Variable
C1B,C2B	30pF Silver Mica
L1	2.6uH Roller Inductor
L2	4T #18 0.6" Diam, 0.7" Long. 0.17uH

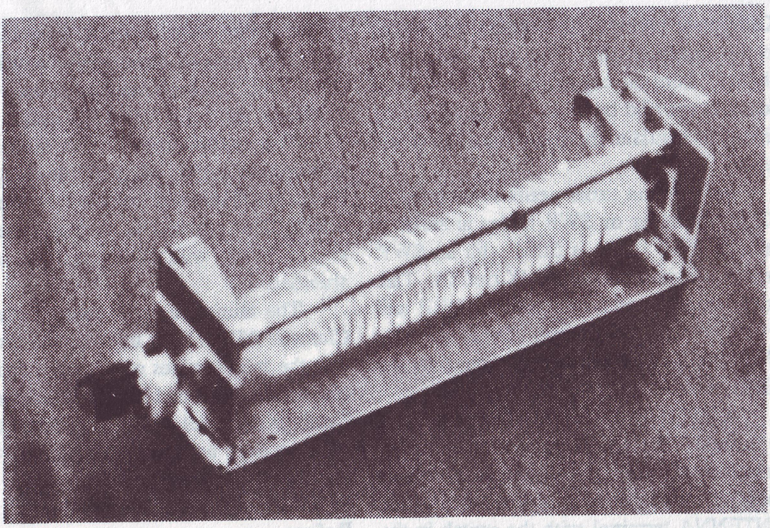
This is not a construction article for some new or revolutionary antenna tuner. Rather, it shows that a homebrew rotary inductor can be built using available materials and with simple hand tools. Here's how to go about it.

Cut a length of 1" diameter acrylic rod 4 3/4" long. Drill a 5/32" diameter hole in each end, as axially as possible. If you have a lathe, the holes will be perfect. In my case, I got the holes as straight as possible by eye. Epoxy a length of K&S brass tubing in each end. (K&S brass tubing is available in nesting sizes from 1/8" to 1/2" at hobby shops). After the epoxy sets, the brass tubing can be bent a little if necessary until the front and rear shafts are aligned.

the turns. Do this by eye, as there is not good way to mark an accurate path for the wire (unless you have a lathe and can cut a shallow thread). Think about the direction of the winding and how the slider will move. You want the inductance to increase with clockwise rotation of the tuning shaft.

When the inductor has 18 turns, the wire should pass over the second screw head tapped into the finished end of the acrylic rod. While maintaining wire tension, solder the wire to the second screw. Clip off excess wire and secure all the wire turns to the rod with a very small amount of CYA instant adhesive. 18 turns on a 1" diameter acrylic rod 3 1/2" long will give L = 2.6uH.

The slider is made from two flanged



K6BSU Roller Inductor

brass eyelets, back to back, (ref. 1) and soldered to a short length of 1/4" brass tubing. This, of course, slides along the main rod of brass tubing. (Remember you should already have a supply of nesting K&S brass tubing). Note that the rod for the slider is angled to be perpendicular to the pitch angle of the inductor windings.

For spring tension, I used a couple of beryllium copper flat springs from a desk latch. Flat clock spring could also be pressed into service if you first test the material for solderability.

The inductor frame is made from pieces of 1/16" double-sided PC board material soldered into a "U" shape. The shaft bearings are made from the ubiquitous K&S brass tubing, with axial stops made from brass nuts soldered to the tubing shafts.

One end of the coil is connected to its shaft with a short piece of wire. Of course, that shaft bearing becomes one of the coil contacts. So cut away the copper foil from the PC board end plate to isolate it from chassis ground. The slider bar is grounded through the flat springs and end plates.

Assembly and Operation:

This rotary inductor, along with the C1 and C2 values shown, will have enough range to tune most resonant antenna systems on 40 Meters and higher frequency bands. The T network will also tune a long wire antenna, but not just any random length wire. Experiment with the length of a long wire until it is within the adjustment range of the turner.

The fixed capacitors C1b and C2b raises the minimum value for the variable capacitors. The air variables shown have a minimum C of about 5pF, which is much too small to be useful at HF. The fixed inductance, L2, is needed for the same reason. It prevents a zero inductance condition, which would be possible with the roller inductor at its extreme end.

Putting this tuner to work on 80 or 160 Meters will require larger L and C values. A rotary inductor wound on a 1.5" diameter acrylic rod with 0.15" spacing and 25 turns will give a total inductance of 8.3uH. This size inductor, with maximum values of C1 and C2 at least 250pF, will be more useful in reaching these lower frequency bands.

The T network requires that the rotors and the stators of C1A and C2A be insulated from the chassis. These are both mounted on a bare epoxy glass board. The tuning shafts are made from (what else?)

K&S brass tubing! The tubing is soldered to the capacitor shaft and then cut in half about 1" from the capacitor. A piece of birch dowel is epoxied between the cut off tubing pieces to insulate the rotor from the panel knob.

An antenna tuner needs some form of RF power meter or SWR bridge to assist in tuning. This tuner is fitted with an SWR bridge designed by GM4ZNX (ref. 2). This bridge circuit works very well for QRP, and it requires no balancing. Other popular SWR bridge circuits may be found in the ARRL Handbook.

A DPDT bypass switch is a good thing to include. The SWR bridge remains in the circuit at all times, and this is especially useful if a dummy load is connected to the ANTENNA terminal with the switch in the bypass position. The forward meter then functions as a watt meter indicator into a 50 ohm dummy load.

I installed two meters for simultaneous reading of forward and reflected power without having to switch back and forth. Individual meter potentiometers were installed so that the forward meter could be calibrated for 5 Watts full scale, and the reverse meter calibrated for 2 1/2 Watts full scale.

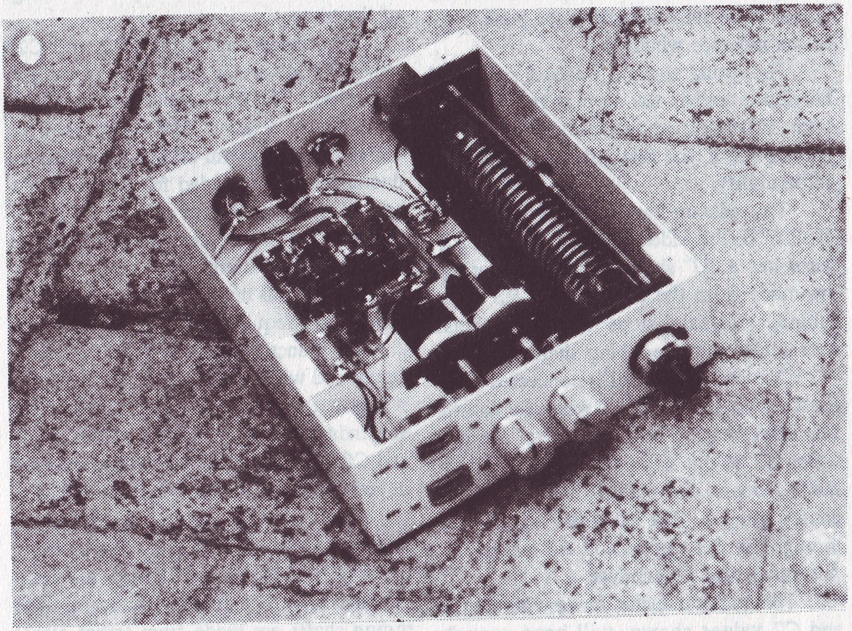
The custom cabinet was made from rectangular panels of 1/16" double sided circuit board material, soldered together into a box. This provides an easy and inexpensive enclosure, with the bonus that it is fully shielded.

The miniature turns counter dial is a Clarostat #316-11. It indicates 15 turns so that the preset values of the roller inductor can be recorded and logged for later use. NestingK&S brass tubing is soldered to the inductor shaft until it is built up to 1/4" for the dial.

Build and enjoy. 72, Floyd, K6BSU

References:

1. Acrylic rod and brass eyelets are available from K6BSU.
2. D. DeMaw "An Easy to Build SWR Bridge". CQ, June 1994, pp. 112-115. (reprint available from K6BSU).



K6BSU Antenna Tuner with SWR Bridge

The Original St. Louis Tuner

by Randy Miller, WA0OUI
12090 Lavida Ave.
St. Louis, MO 63138

[This is a copy of the original manual that came with the St. Louis Tuner that was a club project of the St. Louis QRP Society. It was a project done by several members of the club, and Randy was the author of the manual. NorCal has kitted a version of the tuner and made two small changes, the original tuning caps were replaced with custom air variables and the case was replaced with a custom NorCal style case. Other than that, the kit was as designed. The manual is reprinted her for those of you who were not able to obtain tuner kits or wish to "roll your own". The custom caps are not available as all of them were used in the kits, but circuit boards are available from Jim Cates, 3241 Easwood Rd., Sacramento, CA 95821. Cost is $5 postpaid. $8 DX. US funds only. Make checks and money orders out to Jim Cates and NOT NorCal. KI6DS, Editor.]

Description:

This unit is the combination of a sensitive power meter which reads both forward and reflected power simultaneously, a transmatch for matching transmitter output impedance to antenna feedline input impedance and a dummy load for making transmitter adjustments without producing an interfering signal.

The power meters can read levels from milliwatts to well above the 5 Watt QRP limit. The forward and reflected power scales are independently set with trim Pots inside the it. For example, it is possible to set a forward reading of 0-5 Watts and a reflected reading of 0-100 milliwatts.

The transmatch is a T-match design with switchable parallel variable capacitors and a twelve position tapped inductor for increased flexibility in matching unknown line impedances. A four-to-one output balun is switch selectable for matching low impedance, unbalanced transmitter outputs to high impedance, balanced feedlines.

Four 200 ohm, 2 Watt resistors in parallel provide a 50 ohm Dummy load that will easily handle QRP power levels up to 5 Watts. The dummy load is conveniently switch selectable from the front panel.

Operation:

Front panel controls consist of three switches, (Mode , Inductor and high/low Capacitance) and two variable capacitors for transmitter and antenna adjustment. The mode switch has three settings, OUT, TUNER and DL. OUT means the tuner is not in the circuit; however, the power meters are still active. In the TUNER position, the power meters are used with the tuner to match the transmitter to the antenna. The DL position removes the tuner and connects the Dummy Load following the power meters for transmitter adjustment.

The inductor switch has twelve positions that change the tap point on the tapped inductor (L1) so a match may be obtained over a wide range of frequencies.

The Transmitter and Antenna controls are two-section variable capacitors which are used to obtain a match between the transmitter and antenna. The high/low capacitance switch allows the two sections of the variable capacitors to be paralleled (high) or operated separately (low).

This tuner operates much like those sold by MFJ and Ten Tec. Begin by setting the mode switch to "TUNER", both capacitors approximately mid scale and the paralleling switch in the separate position (Low). Make sure the balun switch is set for the type of feed line you are using. either balanced or unbalanced. Set the inductor switch at either end of its range and apply transmitter power to the unit. Quickly note the reading of the reflected power meter. If not less than full scale, quickly turn off the transmitter, select the next setting of the inductor and again check the reflected power. Continue this procedure until a null in reflected power is observed. Then adjust the

"transmitter" and "antenna" capacitors on the transmatch to reduce the reflected power further, hopefully to zero. If unable to find a match with the capacitor switch in the separate setting, try the procedure again using the parallel position. There may be times when a perfect match (zero reflected power) cannot be achieved but some value less than full scale reflected power can. Depending on how critical SWR is to your transmitter, you may decide to operate with some reflected power showing if that is the best match you can obtain.

To use the dummy load, select the "dummy load" position on the mode switch. Remember the maximum power capability of the dummy load is eight (8) Watts. Try to limit continuous transmission at full rated power (8 W) to no more than 60 seconds with a minute or two cooling period in between.

Construction Notes:

Detailed construction steps are not provided. Therefore, even though this kit is close to "Heathkit" quality in materials and manual , it still will qualify as home-brew for contests and bragging rights. A few explanations and suggestions are in order, however.

* Do as much prep work first such as wind toroids, prepare coax cable sections for toroidal transformers, paint case, attach front panel markings, extend capacitor shafts (spacer & screw) and attach capacitors to case (hot glue or epoxy). Then you can sit down and assemble the kit without major interruptions, having already experienced them!

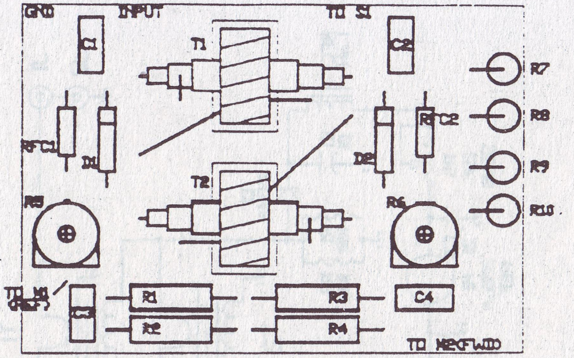
* An important note: The components on the circuit board mount on the same side as the circuit board traces. Murphy was present when the board was laid out but this doesn't present a problem during construction and makes the circuit much easier to trace once the board is mounted in the case. If you want to "sling" some of the components under the board rfc. diode, cap, etc., be creative, but remember to install the trim pot's on the circuit side so they can be adjusted.

* To extend the shafts on the two variable capacitors, included are two 1/4" X 3/8" nylon spacers and corresponding metric threaded screws. Thread the screws through the spacers (a tight fit) and then apply glue (epoxy) to the screw threads before screwing them into the capacitors. This will ensure your knobs don't screw off when you turn them counterclockwise. (Very embarrassing!)

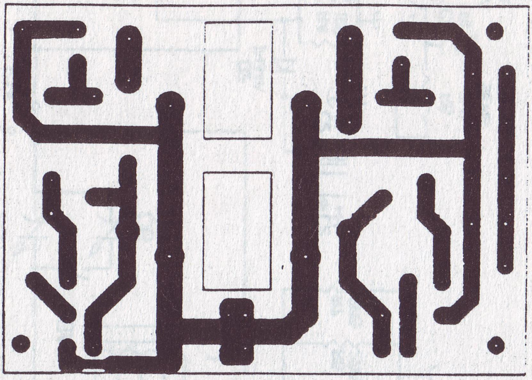
* There are threaded inserts on the front of the variable capacitors which could be used to mount them to the front panel; however, the screws have to be the exact length to clear the front panel but not so long they screw into the capacitor plates (a close tolerance). Therefore, I recommend gluing the capacitors to the front panel with hot glue or epoxy. I've used the hot glue and it does a good job but is a little prone to break loose under mechanical shock. I would recommend epoxy especially some of the newer fast setting varieties. Make sure you have your case painted and the front panel lettered before attaching the capacitors.

To wind the toroids, start by making a "shuttle" for the magnet wire to keep it manageable while passing in and out of the toroid core. The shuttle can be made from cardboard, fiberglass, metal or plastic and should be no more than 3/16" wide by 2.5" long so it can pass easily through the center of the toroid core. Included in the kit is an ordinary plastic straw which makes a nifty wire shuttle. Cut a piece about 2.5" long, cut a 1/4" slit in each end and wind your magnet wire between the two slits.

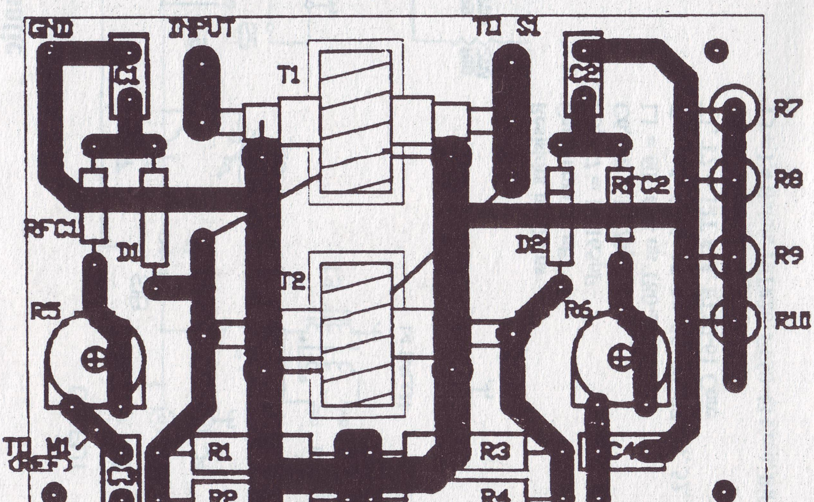
* Enamel can be removed from the magnet wire by several methods. It can be scraped off, sanded off, burned off (?) or dissolved with a chemical like "Strip-X" made by GC Electronics and available at Van Sickle Electronics on South Broadway & 7th St. I prefer and strongly recommend using Strip-X. I scraped the enamel on the first prototype but used Strip-X on the second. What a difference! Just dip the wire in Strip-X and then wipe off the enamel. Someone can buy a jar and share it at your local club meeting. Have a toroid winding night!



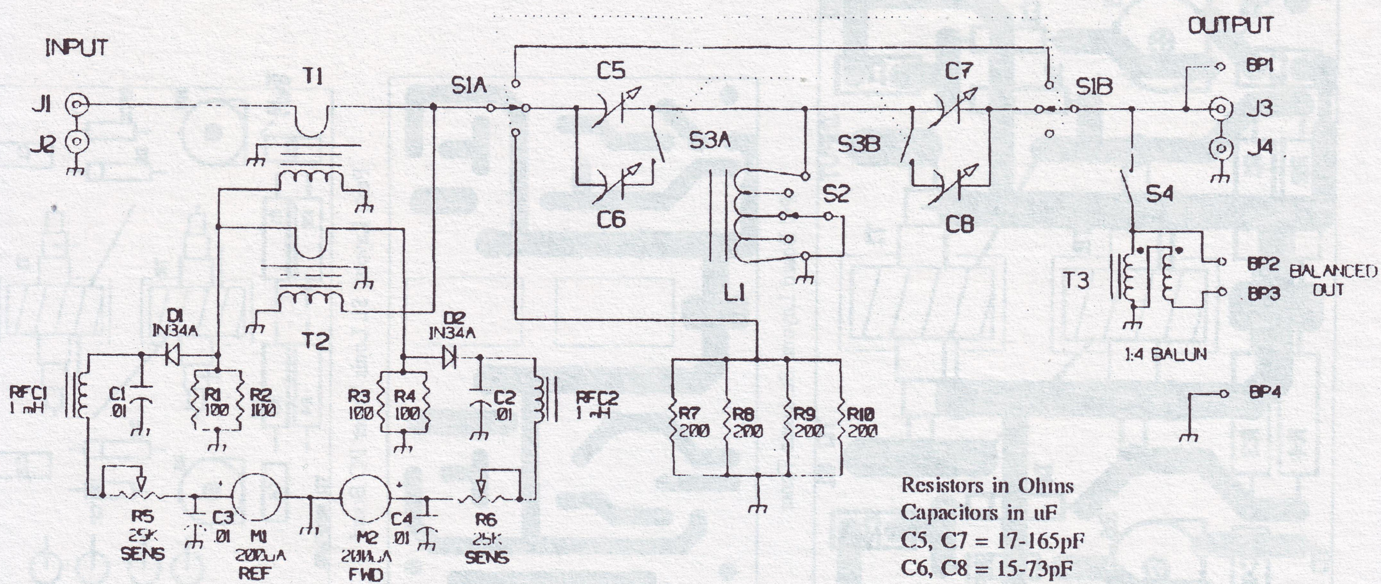
Parts Layout, St. Louis Tuner PC Board



PC Board Layout, St. Louis Tuner



St. Louis Tuner Schematic



Resistors in Ohms
Capacitors in uF
C5, C7 = 17-165pF
C6, C8 = 15-73pF
L1 = 60t. #24 on T80-2 Core
Tap at 3, 6, 10, 15, 20, 25, 30, 37, 44, 52, 60 turns.
T1, T2 = 12T #24, FT50-61 Core
RG58 Coax Primary
T3 = 1:4 Balun, 10T#26, FT50-43 Core, Bifilar Wound

* Remember when winding toroidal coils that the turns are counted inside the core. Every time the wire passes through the core it counts as a turn even if it does not go around the core.

* The inductor for the transmatch is wound on a T80-2 (Red) core, 60 turns of #24 wire. Tap the inductor at turn number 3, 6, 10, 15, 20, 25, 30, 37, 44, 52 and 60. Leave plenty of wire to make your taps. I usually leave a loop about one inch long, secure each loop with a twist or two and wind the whole coil with these one inch loops sticking out. Then I go back and strip each loop, one at a time and then twist the loops into a twisted pair. This method results in much cleaner taps which are easier to solder to the switch lugs than if the wires are twisted together first and then stripped. When twisting the taps together, I try to position the taps so they mate with the switch lugs.

* Coaxial Transformers T I & T2 are wound on a FT50-61 core with a secondary of 12 turns #24 wire and a primary of RG-58 coaxial cable center conductor running through the center of the toroid. The coax shield acts as a Faraday screen preventing TI & T2 from picking up harmonic currents and causing false readings. When connecting the Faraday shield to the circuit board, be sure to only ground them on one end, not both ends!.

* When winding the balun, a bifilar winding is used. Bifilar means that two wires make up the winding instead of a single one. There are several ways to make this winding but the easiest is to twist the two wires together into a twisted pair and then wind them on the toroid core. A small hand drill can be used to twist the pair of wires as well as a small locking clamp (hemostat) or long nose pliers. Six or Seven turns per inch is usually adequate don't get carried away and make the turns too tight. Magnet wire, of two different colors, is included for the balun so you can easily tell which winding is which and then connect them properly. Follow the diagram included in the section on baluns and note the phasing dots which show the two leads which are together at the start of the winding and ensure proper phasing for transformer voltages.

* There are two sections in each variable capacitor, the Antenna and Oscillator section which share a common connection. The connections are identified on the capacitor with an 0, G and A next to the leads corresponding to Oscillator, Ground (Common) and Antenna sections. The approximate values for each section are Oscillator: 15-73 pF and Antenna: 17-165 pF. The prototype tuners were built with the Antenna section (17-165) in line all the time and the Oscillator section (15-73) switched in parallel when more capacitance is needed for a match.

* Also the variable capacitors have small trimmer capacitors across each section. These trimmers are visible from the rear of the case and have a small flat blade screwdriver adjustment. Adjust both trimmers for minimum capacitance (plates unmeshed) to ensure minimum capacitance can be reached with the main capacitor.

* We hope all goes well with your kit building. Attached are some notes from the 1994 handbook and the ARRL data book giving some additional information on winding toroids and baluns. Enjoy!! 72, Dave, NF0R and Randy, WA0OUI

Parts List for ORIGINAL ST. LOUIS TUNER

1		Cabinet
6"	T1,T2	Cable, coaxial, RG-58, 6"
4	C1-C4	Capacitor, .01 mfd. ceramic disk, 50V
2	C5-C8	Capacitor, variable
2	RFC1,2	Choke, RF, 1mH, 5%
3	BP1-3	Connector, binding post, 5 way
2	J1, J3	Connector, coax jack SO-239, single hole

1	BP4	Connector, ground, 5 way
2	J2, J4	Connector, phono jack, (RCA)
2	D1, D2	Diode, 1 N34A
4		Feet, rubber
2	M1, M2	Meter, 200 uA
1		Printed Circuit Board
4	R1-R4	Resistor, 100 ohm, I watt, 5%
2	R7,R8	Resistor, 200 ohm, 2 watt, 5%
2	R5,R6	Resistor, variable,'trim pot, 25K ohm (PC
4		Screws, 4-40 x 1/4 & Nuts
3		Screws, 4-40 x 3/4 & Nuts
3		Spacers, Nylon, 3/32 x7/16
2		Spacers, nylon, 1/4 x 3/8
2		Screws, metric
1	S2	Switch, rotary, 1P12Pos
1	S1	Switch, rotary, 2P3Pos
1	S3	Switch, toggle, DPDT
1	S4	Switch, toggle, SPST
1	T3	Toroid, ferrite, FT50-43 (balun)
2	T1, T2	Toroid, ferrite, FT50-61 (bridge)
1	L1	Toroid, powdered iron, T80-2 (inductor)
		Wire, hook-up, stranded
L1, T1, T2		Wire, Magnet, #24 (bridge, inductor)
	T3	Wire, Magnet, #26 (balun)

[Note: The following information isfrom the1994 edition of the ARRL Handbook and the ARRL Data Book.]

How to Wind Toroids

The effective inductance of a toroid coil or a transformer winding depends in part distributed capacitance between the coil tums and between the ends of the winding. When a large number of tums are used (for example, 500 or 1000), the distributed capacitance can be as grert as 100 pF. Ideally, there would be no distributed or parasitic capacitance, but this is not possible. Therefore, the unwanted capacitance must be kept as low as possible in order to take proper advantage of the AL factors discussed earlier in this section. The greater the distributed capacitance, the more restrictive the transformer or inductor becomes when applied in a broadband circuit. In the case of a narrow-band application, the Q can be affected by the distributed capacitance.

The pictorial illustration at Fig. 1B shows the inductor tums distributed unifomly around the toroid core, but a gap of approximately 30° is maintained between the ends of the winding. This method is recommended to reduce the distributed capacitance of the winding. The closer the ends of the winding are to one another, the greater the unwanted capacitance. Also, in order to closely approximate the desired toroid inductance when using the AL formula, the winding should be spread over the core as shown. When the tums of the winding are not close wound, they can be spread apart to decrease the effective inductance (this lowers the distributed C). Conversely, as the turns are pushed closer together, the effective inductance is increased by virtue of the greater distributed capacitance. This phenomenon can be used to advantage during final adjustment of narrow-band circuits in which toroids are used.

The proper method for counting the turns on a toroidal core is shown in Fig. 1C. The core is shown as it would appear when stood on its edge with the narrow dimension toward the viewer. In this example a four-turn winding has been placed on the

winding method is to discourage unwanted capacitive coupling between the windings, which aids in the reduction of spurious energy (harmonics, and so on) that might be present in the circuit where the transformer is used.

In circuits that have a substantial amount of voltage present in the transformer windings, it is good practice to use a layer of insulating material between the toroid core and the first winding. Alternatively, the wire itself can have high dielectric insulation, such as Teflon. This procedure prevents arcing between the winding and the core. Similarly, a layer of insulating tape (3-M glass tape, Mylar or Teflon) can be placed between the primary and secondary windings of the toroidal transformer (Fig. 1D). Normally, these precautions are not necessary at impedance levels under a few hundred ohms for RF power levels below 100 watts.

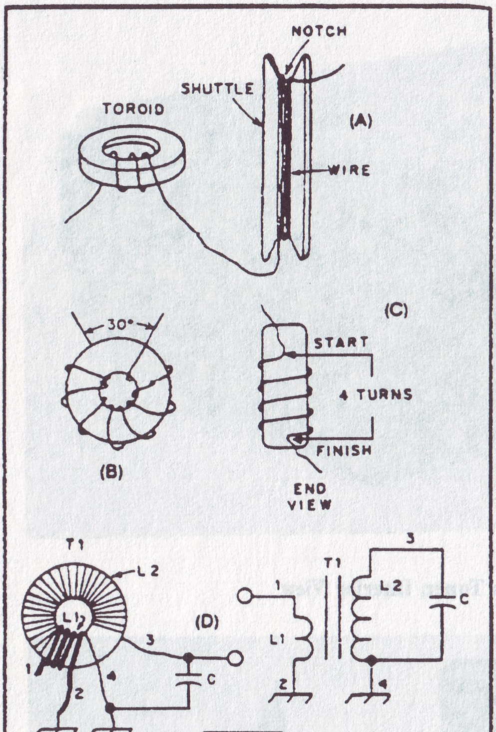


Figure 1

core.

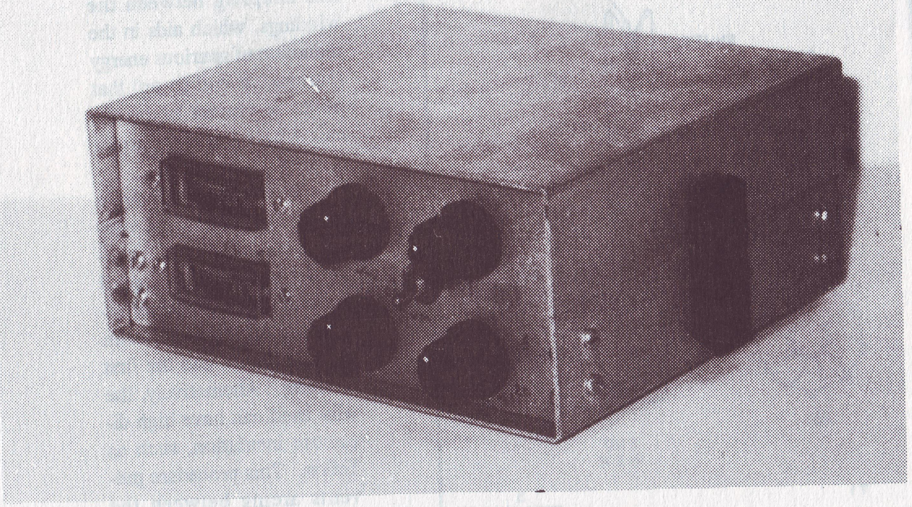
Some manufacturers of toroids recommend that the windingson toroidal transformers be spread around all of the core in the manner shown in Fig. 1B. That is the primary and secondary windings should each be spread around most of the core. This is a proper method when winding conventional broadband transformers. However, it is not recommended when narrow-band transformers are being built. It is better to place the low-impedance winding (L1 of Fig. 1D) at the cold or grounded end of L2 on the core.

This is shown in pictorial and schematic form at Fig. 1D. The windings are placed on the core in the same rotational sense, and L1 is wound over L2 at the grounded end of L2. The purpose of this

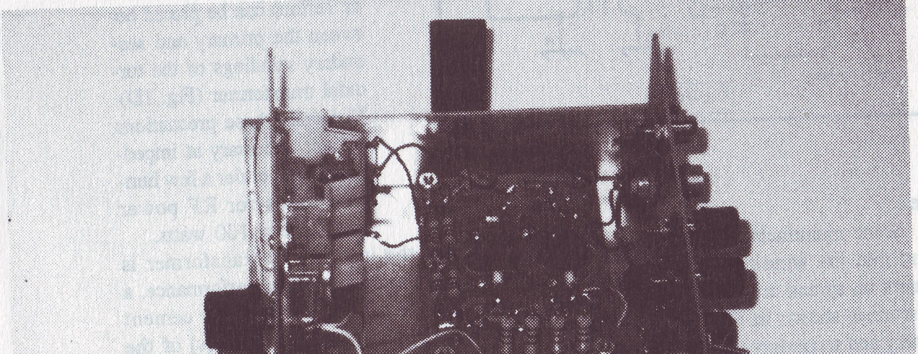
Once the inductor or transformer is wound and tested for proper performance, a coating or two of high-dielectric cement should be applied to the winding(s) of the toroid. This protects the wire insulation from abrasion, holds the turns in place and seals the assembly against moisture and dirt. Polystyrene Q Dope is excellent for the purpose.

The general guidelines given for toroidal components can be applied to pot cores and rods when they are used as foundations for inductors or transformers. The important thing to remember is that all ofthe powdered-iron and ferrite core materials are brittle. They break easily under stress.

Balun Transformers

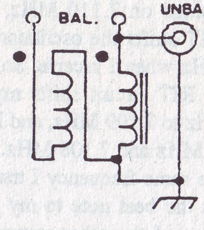


St. Louis Tuner, Interior View



St. Louis Tuner, Exterior View

It is important to keep in mind that a balun transformer is designed for a specific integer of impedance transformation- 1:1, 4:1 and 9:1, for example. This is a broadband transformer that will operate from, say 1.8 through 30 MHz. Baluns that contain magnetic cores, such as ferrite rods or toroids, provide the best broadband characteristics. The Figure below shows the wiring scheme for 4:1 balun transformers. Correct



4:1 BALUN

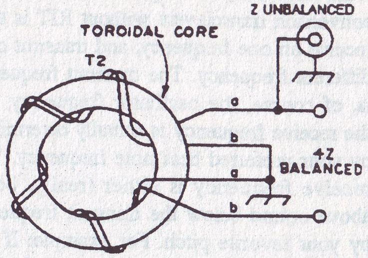
● PHASING

operation will occur only when the polarity of the windings (marked with a black-dot) is observed.

In an ideal situation the balun should be used between two known resistive conditions 50 ohms to 50 ohms or 50 ohms to 200 ohms, for example. A reactive load will cause the balun to function improperly; if the mismatch is great enough; the balun can become hot (saturated). In a worst-case situation the core may change mu permanently, or the core may break. Core saturation can cause TVI by virtue of square-wave generation (rich in harmonics). Therefore, the core cross-sectional area must be chosen for the RF power level anticipated.

Baluns and other broadband RF transformers are intended for relatively low impedance values. Ohmic termination values greater than 500-600 ohms are not recommended. This is because the higher the load impedance, the greater the developed voltage within the transfofrmer. This will cause rapid core saturation and voltage arcing between the windings and the transformer core.

Although some commercial Transmatches contain built-in 1:1 baluns for feeding balanced transmission lines, the line impedance should not exceed the proper secondary-load impedance of the transformer (50 ohms for a 1:1 balun and 200 ohms for a 4:1 balun). Some manufacturers imply (through text omission) that the Transmatch will work witli any balanced load. This may be true to some extent when using 100 watts or less. In this case tlie balun may not overheat, but it is definitely not in its proper impedance environment, and true balanced feed is in question. In other words, a balun transformer is not a cure-all for a variety of unknown load im-



4:1 BALANCED TO UNBALANCED VOLTAGE BALUN

pedances.

Ferrite-core baluns can provide a high impedance over the entire HF range. They may be wound either with two conductors in bifilar fashion, or witli a single coaxial cable. Rod or toroidal cores may be used. Current through a choke balun winding is the "antenna current" on the line; ifthe balun is effective, tliis current is small. Baluns used for high-power operation should be tested by checrng for temperature rise before being put into full service. If the core overheats, tums must be added or a larger or lower-loss core must be used. It also would be wise to investigate the cause of such high line antenna currents. Type 72, 73 or 77 ferrite will give the greatest impedance over the HF range. Type 43 ferrite has lower loss, but somewhat less impedance. Core saturation is not a problem with

these ferrites at HF; they will overheat due to loss at flux levels well below saturation. Eight to ten turns on a toroidal core or 10-15 turns on a rod are typical values for the HF range. Winding impedance increases approximately as the square of the number of turns.

Add RIT to the Pixie 2

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I was browsing QRP-L late in December, 1995, when I encountered the messages of Nick Franco, KF2PH. He described his experiences with the Pixie 2 QRP transciever. I had built one of these, too.

What interested me was Nick's struggle with RIT. The usual problem with direct conversion transcievers without RIT is they receive on one frequency, and transmit on a different frequency. The transmit frequency is, of course, the oscillator frequency, but the receive frequency is actually determined by your preferred beat note frequency. The receive frequency is either (really, both) above or/and below the transmit frequency by your favorite pitch. For example: If my oscillator generates 7.110 MHz, and I like 1 kHz pitch, then I will be transmitting on 7.110 MHz, but receiving on 7.111 and 7.109 MHz without the benefit of RIT. Two transcievers operating like this can't use the identical transmitting frequency, but they must transmit on frequencies separated by the beat note. Some guys like low tones, while other like higher, but, both sides must hear the same pitch without RIT.

Example: I transmit on 7.110 MHz, receive on both 7.111 MHz and 7.109 MHz. You must then transmit on either 7.111 MHz (which means you receive 7.110 and 7.112 MHz) or 7.109 MHz (then you receive on 7.108 and 7.110 MHz). Notice that each of us is listening to a different unwanted sideband. QRM misery can visit us in these extra sidebands.

Now, RIT can't solve the double sideband problem of direct conversion receivers, but the frequency offset of the two transmitters can be fixed. What RIT does is offset the oscillator between receive and transmit by the desired beat note. Now my oscillator transmits on 7.110 MHz, as always, but the RIT shifts the oscillator by my favorite 1 kHz when I receive. So, during receive, my RIT circuit shifts my oscillator down 1 kHz to 7.109 MHz, and I am receiving 7.110 MHz and 7.108 MHz. Now I can receive the same frequency I transmit, yet I can adjust the beat note to my satisfaction independent of the other station. Note in this RIT example, I could have shifted my oscillator up by 1 kHz instead, receiving on ??? (the quiz part) frequencies.

I think that's enough of the what and why of RIT, so, on to the important HOW of RIT. Now back to Nick. Nick used a series inductor capacitor network for pulling the crystal. This is well established technique. For example, August 1995 QST has a construction article using this. The QST article suggested mysterious (to me) series inductors instead of a single inductor. The circuit subtleties for optimizing the pulling range are unnecessary for the limited range of RIT. Nick first used a variable capacitor, then he tried two capacitors in parallel, with one of them switched in/out of the circuit for RIT.

When I read about his using a manual rx/tx switch for RIT, I immediately knew how to solve the switch problem. The problem was how to somehow change the capacitance of the crystal pulling network from transmit to receive. My short answer is to use the voltage across the key to operate a varicap that shunts the capacitor in the pulling network. With the key up, receiving, there's voltage across the key, relatively constant (I'll ignore the audio signal that's

there). Key down, it's zero volts. By some stroke of luck, a resistor is across the key. I changed this to a pot of the same value (the ends of the pot go where the 10K ohm resistor was.) Now, when the key is up, in receive, the pot wiper may be adjusted to control the RIT offset. Key down, both ends of the pot at ground, wiper voltage is zero, for fixed transmit frequency. What's still needed is the connection between the pot wiper and the varicap. This is a largish resistance (100k ohms or higher), it dissipates no power, so 1/4W, 1/8W etc. is okay. Since it has no steady current through it (the varicap changes its capacitance by varying the reverse bias across the junction) the value isn't too critical, however extremely large values (I'll guess greater than 1 meg ohm) might start to cause hearable chirp.

To summarize, start with the original Pixie 2 circuit, replace the 10K resistor across the key by the two ends of the RIT adjustment 10K pot. Lift up the ground end of the crystal and connect it to one end of an 18 microhenry choke (another like the one in the collector of the final/mixer.) The other end of this choke connects to one side of a 82 picofarad capacitor (another like the coupling cap between the osc. and final/mixer.) Also at this connection is the CATHODE end of a varicap (I used a Motorola MVAM 109, but I'm advised that a common rectifier diode such as 1N4001 to 1N4007 might also work as a varicap), and that largish dc coupling/rf isolating resistor (I had 150K ohms.) Ground the free end of the 82pF. cap and the ANODE of the diode or varicap; finally the free end of the new resistor connects to the wiper of the 10K ohm RIT adjustment pot.

I guess that's five parts (can you get a trade in allowance for the old 10K resistor?) This circuit pulls my 7.125 MHz crystal down to about 7.110 MHz in transmit, with a few kHz adjustment in receive. I didn't use a counter, so that's a guess. I bet you could replace that fixed 82pF capacitor with a variable (no, it doesn't have to be 82pF.—probably a 50, or a 150, or even a 365 pF variable would work) to move the transmit frequency, too. The RIT will interact with the adjustment of this cap, however.

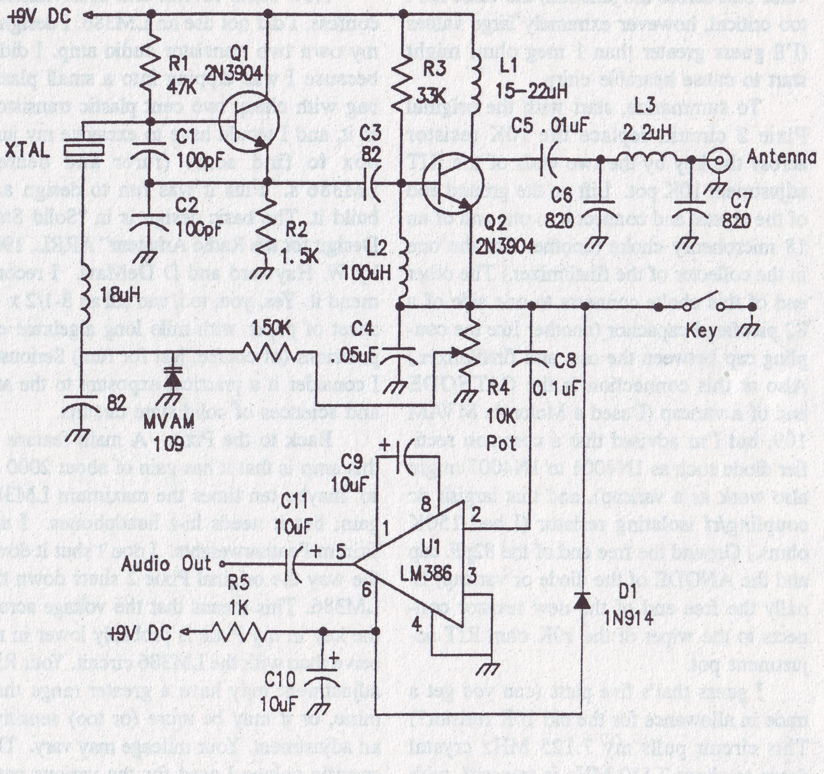
I adjusted the RIT using my Sierra. I had to wrestle it out of my son's hands to use it. First, I vaguely recall that the Sierra has no tx/rx offset when the received beatnote is the same pitch as the sidetone and its RIT is off. Okay. Pixie key down driving dummy load, etc. tune Sierra for same received pitch as Sierra sidetone. Now Pixie key up, (whew, that tiny plastic final in the Pixie can overheat) Sierra transmitting (NOT into the Pixie directly) adjust Pixie RIT for desired beatnote (don't change Sierra tuning here.) That's how I did it.

Now some caveats and observations. I confess, I did not use an LM386. I designed my own two transistor audio amp. I did it because I was dipping into a small plastic bag with cheap two cent plastic transistors in it, and I would have to excavate my junk box to find some (rarer and dearer) LM386's. Plus it was fun to design and build it. The basic design is in "Solid State Design for the Radio Amateur" ARRL, 1986 by W. Hayward and D DeMaw. I recommend it. Yes, you, too, can fill an 8-1/2 x 11 sheet of paper with mile long algebraic expressions (of course, just for fun.) Seriously, I consider it a practical exposure to the arts and sciences of solid state circuits.

Back to the Pixie. A main feature of this amp is that it has gain of about 2000 or so, maybe ten times the maximum LM386 gain; but it needs hi-z headphones. I use Trimm Featherweights. I don't shut it down the way the original Pixie 2 shuts down the LM386. This means that the voltage across the key in my Pixie is probably lower in receive than with the LM386 circuit. Your RIT adjustment may have a greater range than mine, or it may be more (or too) sensitive an adjustment. Your mileage may vary. The specific values I used for the various parts were what spares I had left from building the plain Pixie. A look at the QST article suggested that I was in the ballpark, and the proof of the pudding...I spent no effort to temperature compensate the varicap. Be my guest.

I only briefly imagined what the varicap does to the oscillator's waveform or harmonic content. Especially around zero bias, the capacitance varies (nonlinearly, even) with voltage. Watch out for the back wave. I noticed sufficient output in receive to drive an amplifi@ed resistive reflection coefficient bridge very well. Of course, it's at least an order of magnitude (10 dB) or more down, but that's still a second signal. (how about FSK for RTTY?)

Now for the interesting part. I am working on a scheme to add sidetone to the Pixie. My secret weapon is that discrete amplifier. All the nodes of that circuit are exposed to my whims... I need to add a switch transistor, however. Either stage may be shunted by an R-C phase shift network to make that stage oscillate at an audio frequency, with the switch transistor, driven by the good ol' voltage across the key, shorting out the middle of that network in receive, to allow oscillation only with key down (sidetone!!) I suspect that something could be done with the LM386 as well; I notice an uncommitted input, some gain adjust nodes are assessable..... who knows? SSB next? 72, Jeff, KD6MNP



Pixie 2 With RIT

Crystal Calibrator

by Elmer Harger, KM6FG
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At the January NORCAL club meeting, I brought along my crystal calibrator and several members were interested in it including Doug KI6DS. Doug suggested that I write up an article for QRPp.

A crystal calibrator or marker generator is a very handy accessory especially for a QRP station. I built one described in the ARRL handbook 1991 - 1996. This generator provides markers at 25, 50 and 100 kHz intervals and has enough harmonic content to be useable through 30 Mhz and beyond. The purpose of a crystal calibrator is to verify or calibrate your receiver dial reading. The NORCAL Sierra, for instance, does not have a digital readout but does have markings at 0, 50, 100, 150 and marks at 5 kHz intervals. These markings are meaningless unless they are calibrated. A good way to calibrate the Sierra is to build the band module for 30 meters and then calibrate the dial at 0 to WWV on 10.000 MHz.

That is fine except for one thing, the receiver is calibrated at one point on the dial and on only one frequency. The marker generator however allows us to calibrate the receiver across the entire dial on all bands and allows us to verify the dial calibration each time we use the receiver. This is important if we don't want to operate outside of the band, an FCC requirement. To use a marker generator, it must first be set against a standard frequency source. The frequency standard is the National Institute of Standards and Technology radio stations WWV and WWVH at 2.5, 5, 10, 15 and 20 Mhz. These stations can be used to zero beat the marker generator. To do this you can use a receiver that will tune to any one of these frequencies, turn on the marker generator and you should here a beat note from the speaker or earphones. The marker generator has a trimmer capacitor that can be adjusted (C1 in the handbook diagram) so that the beat can be zeroed (the beat eliminated). When this is done the marker generator is set and can now be used to calibrate your Sierra, NORCAL 40, etc.

Calibrating the Sierra is easy using this generator. With the Sierra turned-on and a short piece of wire connected to the Sierra antenna jack (about 2-3 feet of wire will do), turn-on the calibrator and also connect a short wire to its output. This will provide enough signal to make the calibration. Tune the Sierra dial to 0, you might have to rock the dial back and forth about 5 to 10 kHz either side of zero to get a beat note like you did when calibrating the marker generator on WWV. When you find the beat note, adjust the Pre-Mix trimmer C70 on the Sierra band module. Make this adjustment until you can set the zero beat point right on 0 of the Sierra dial. When this is done, tune the dial to 150. Check and see if this point also zero beats, it probably won't. This is normal, and will probably require some adjustment of the VFO master oscillator per the NORCAL Sierra tune-up procedures in your instruction manual. Ounce you have been able to get a zero beat at 150 on the dial, then go back to 0 and again check for zero beat condition. You may have to go back and forth several times on your first try when doing the first band module alignment. However after doing one band module and checking at 0 and 150 on the dial, the other band modules will fall into place once you set them to 0 on the dial.

Now that you have calibrated the 0 and 150 points on the dial, it is time to check the rest of the dial for linearity. The dial may not necessarily be linear or it might be right on throughout the dial. I found that I was able to get my VFO to be linear across the dial almost without exception, except for an error of only a few hundred Hz at 150. Now check using the calibrator at 25 kHz

intervals. It can be used daily to check your frequency and can be used each time you change band modules to verify dial accuracy and band edges. At this point you can see the nice advantage of having a calibrator.

The marker generator was made by obtaining the circuit board from FAR Circuits in Illinois. The circuit can be made using several options. The crystal Y1 in the circuit can be 1,2 or 4 MHz, I elected to use a 4 MHz crystal as they are easy to obtain locally. Most of the parts were obtained at Anchor Electronics or Halted Specialties in the Sunnyvale-Santa Clara CA area or can be ordered from Mouser Electronics.

The marker generator uses digital technology and consists of four IC TTL 74xx series chips. The master oscillator is a quad nand gate 74ALS00, the first two sections serving as the oscillator, a third section acting as a buffer and the last section is not used. A 74ALS74 dual flip-flop is used to divide by 2 or 4 as required. If a 1 MHz crystal is used, then the dual flip-flop is not needed, however if a 2 or 4 MHz crystal is used then a divide by 2 or 4 respectively is required to get a 1 MHz reference frequency. Following this we need to divide by 10 and use a 74LS90 decade divider chip. That now gives us a 100 kHz calibrator frequency. One more chip is needed for our marker generator, another 74ALS74 is used to divide by 2 and by 2 again. This gives us outputs at 50 and 25 kHz. We now have all the required outputs. A two pole four position switch is the only control needed to operate the calibrator, the 4 positions are OFF-25-50-100 kHz.

The entire calibrator was built into a Ten-Tec aluminum cabinet measuring 3.75 x 3 x 1.5 inches. It also includes a 9 volt transistor radio battery, a 5 volt regulator IC (78L05) and a BNC RF connector. Have fun and keep on building. 73, Elmer

Optimized Band Module Values for the Cascade

by Dave Meacham, W6EMD
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Here are the optimized values that I have found to work best with the Cascade band modules. I am getting 9 Watts on 75M and 7W on 20M. All caps Silver Mica 300Volts/5%

75M Band Module:

Low Pass Filter Values

L2, L3	23T #26 or #28 Wire, T37-2 Core, 2.1uH
C12	680pF
C13,14	150pF
C15	1200pF
C16	560pF

TX Filter Values

L4,5	12T #26 or #28 Wire, T37-61 Core, 7.96uH
C3,11	820pF
C5,9	240pF
C7	1500pF

RX Filter

No Changes

20 Meter Band Module:

Low Pass Filter:

L2,3	12T #26 or #28 wire on T37-2 Core. 0.58uH
C12	220pF
C15	430pF
C16	200pF

TX Filter:

L4,5	14T #26 or #28 wire on T37-2 Core. 0.78uH
C3,11	39pF
C4,10	47pF
C5,9	82pF
C7	9pF (Critical, a selected very-low 10pF ok)

RX Filter:

L1	27T #28 or #26 wire on T37-2 Core. 2.9uH
T1	3T Primary #24, 29T Secondary #28 on T37-2 Core.

Back Issues of QRPp

Back issues of QRPp are available in bound issues only. volume 1 contains the 3 issues from 1993. Volume II contains the 4 issues from 1994, and Volume III has the 4 issues from 1995. Volume I is 140 pages and is $10 plus $2 shipping for US addresses, $5 DX. Volume II is 296 pages and is $15 plus $2 shipping for US addresses, $5 DX. Volume III is 276 pages and is $15 plus $2 shipping for US addresses, $5 DX. If you order all 3 voumes the cost is $40 plus $3 shipping for US addresses, $10 DX. To order send your money to Doug Hendricks, 862 Frank Ave., Dos Palos, CA 93620. Make all checks and money orders out to Doug Hendricks and NOT to NorCal or QRPp. All prices are for US Funds only.

Curtis 8044ABMKeyer Chip and Far Circuits Board Combo

NorCal has made a bulk purchase of the Curtis 8044ABM Keyer Chip and is offering it with the Far Circuits Board and the Info Sheet for $17.00 Postpaid. DX orders add $5 shipping. US Funds ONLY!! Make Checks or Money Orders out to Jim Cates, NOT NorCal! Send your orders to: Jim Cates, WA6GER, 3241 Eastwood Rd., Sacramento, CA 95821.

7.040 Crystals

We have located a supply of 7.040 crystals in the small HC49 holders. These are on the QRP calling frequency for 40 meter CW. The price is $3 each postage paid. Make Checks or money orders out to Doug Hendricks, NOT NorCal. Send to: Doug Hendricks, 862 Frank Ave., Dos Palos, CA 93620.

NorCal QRP Club

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